AN INVESTIGATION OF WAYS TO REDUCE
THE FAILURE RATE OF STUDENT PILOTS
DURING FLYING TRAINING IN THE ROYAL
AUSTRALIAN AIR FORCE

THESIS

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Royal Australian Air Force

AFIT/GLM/LSR/87S-63

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DEPARTMENT OF THE AIR FORCE

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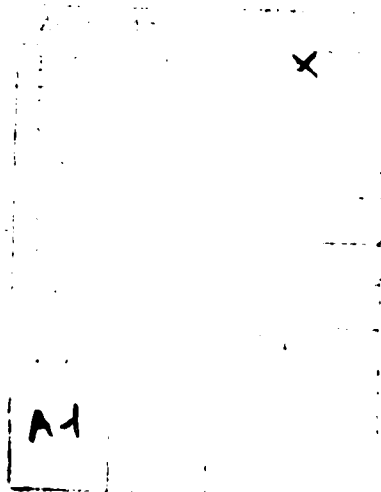
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AN INVESTIGATION OF WAYS TO REDUCE THE FAILURE RATE

OF ROYAL AUSTRALIAN AIR FORCE STUDENT PILOTS

DURING FLYING TRAINING

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

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In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Logistics Management

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Preface

The initial purpose of this study was to analyze an already administered survey. The given survey had been administered to student pilots in the Royal Australian Air Force in an attempt to identify problem areas in the RAAF pilots course. Identified problem areas were to be reviewed in order to reduce the failure rate of student pilots in the RAAF.

After reviewing the literature, the researcher concluded that the given survey did not adequately investigate the identified areas of a pilot training course. The given survey did, however, provide a wealth of information which the researcher used to develop an improved survey instrument. This new survey should be used to continue the investigation for possible problem areas in the RAAF pilots course.

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Abstract

The initial purpose of this study was to analyze an
already administered survey, The given survey had been
administered to student pilots in the Royal Australian Air
Force in an attempt to identify possible problem areas in
the RAAF pilots course. Identified problem areas were to be
reviewed in order to reduce the failure rate of student
pilots in the RAAF. The study had five basic objectives:
(1) Identify those factors in a pilot training course that
could significantly influence the performance and progress
of a student pilot. (2) Establish the criteria for a valid
survey instrument that would identify those factors causing
poor student performance. (3) Determine if the existing
survey was effective in identifying those factors causing
poor student performance. (4) Analyze the existing survey
and assess the value of the data. (5) If necessary,
construct an improved survey instrument.

It was found that the broad aspects of training which
affect a student's performance are learning, motivation and
evaluation. These broad aspects were further defined and
expanded to suit a pilot training course. The existing
survey contained a great deal of information but not in the
form that allowed statistical testing of any power. The
information contained in the existing survey was used to

construct an improved survey instrument to investigate if

problem areas exist in the current RAAF pilots course. It

is recommended that this new survey instrument be used to

continue research into possible problem areas in the RAAF

pilots course.

AN INVESTIGATION OF WAYS TO REDUCE THE FAILURE RATE
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DURING FLYING TRAINING

I.   Introduction

Background

> As the pilots quit the squadron their places
> were taken by selected candidates from the
> Australian Light Horse. All other things being
> equal, the good horseman has all the qualities of
> the good airman. The head and hands required of
> him in horse-mastery are precisely what the
> skilful pilot needs. The cavalryman must have a
> good eye for country; so must the airman. It
> seemed natural that, with the traditional scouting
> duties of the mounted troops being transferred to
> the air, the horsemen themselves should follow
> suit - No 1 Squadron, Australian Flying Corps,
> Palestine, 1917 [32:18].

During World War I, Australia was the only Dominion of

the then British Empire to form and operate her own flying

corps. She did so in such strength that at the end of the

war the Australian Flying Corps (AFC) comprised four

operational squadrons serving in conjunction with the Royal

Air Force, together with a wing of four training squadrons

in England, and the Central Flying School at Point Cooke,

Victoria, in Australia (32:9).

After the Australian Minister for Defence, Senator G.

F. Pearce, attended the Imperial Conference of 1911, and

visited European military aviation centres, he became

convinced of the wisdom of having a flying school in the

Defence Department. In September 1912 an Australian Army

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order (40:380) created the establishment of a flight,
comprised of four officers and thirty-nine other ranks. As
a result of this order, two flying instructors, H. A. Petre
and E. Harrison, were appointed as Lieutenants in the
Australian Aviational Instructional Staff, Australian Flying
Corps (32:9).

During June 1913 Senator Pearce announced in the
Australian Federal Parliament that the first flying school
in the British Empire outside Britain was to be formed.
Petre and Harrison, together with four mechanics obtained
from England, and the school's five aircraft arrived in
Australia in late 1913 to form the Central Flying School
(32:9).

Originally a site at Canberra had been chosen by the
Army for the flying school, but instead a site known as
Point Cooke, near Werribee, Victoria was purchased. The
site had the advantage of being not only level but also on
the shore of Port Phillip Bay, enabling operations by both
landplanes and seaplanes. By February 1914 the instructors
and mechanics were established under canvas at Point Cooke,
and on 1 March 1914, Harrison made the first flight from the
airfield in a Bristol Boxkite. Throughout the winter the
staff laboured to turn grazing land into an aviation
school. By late July the school was ready to accept pupils
(32:9).

Four Australian Army officers, Lieutenants R. Williams,
G. P. Merz, D. T. W. Manwell, and Captain T. W. White, were

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attached to Point Cooke and began aviation training on 17

August. After an average of ten hours' flying, all were

declared qualified pilots. Two pupils of this course were

destined to rise to great heights in public life.

Lieutenant R. Williams was later Air Marshal Sir Richard

Williams, first Chief of the Air Staff, Royal Australian Air

Force. The other, Captain T. W. White, became Sir Thomas

White, member of several Commonwealth Government Cabinets,

and later Australian High Commissioner in London (32:9).

During late 1915, in recognition of the British Army

Council's suggestion that the Dominions might wish to form

complete squadrons for service with the Royal Flying Corps,

the Australian Government adopted the suggestion.

Accordingly, No 1 Squadron AFC embarked and set sail for

Egypt (32:16). Australian squadrons saw service in

Palestine and France. After its return from active service

early in 1919 the AFC was disbanded, and in its place the

Australian Air Corps was formed at Point Cooke to man the

flying school.

On 15 February 1921 the Air Board made a recommendation

to the Air Council that the Australian Air Force be formed

as from 31 March 1921 (40:392). Approved by the Minister

for Defence, and the Air Council, the Australian Air Force

formally came into existence on that date (40:391). The

prefix 'Royal' was granted in August of the same year

(32:42).

During World War II, Australian squadrons saw service
in many theatres. Australia, along with New Zealand, Canada
and Southern Rhodesia were centres for air training,
producing pilots, observers and gunners under the Empire Air
Training Scheme. The Royal Australian Air Force (RAAF)
flying training effort was scaled down dramatically after
the cessation of hostilities. In 1948 No 1 Pilots Course
began training and graduated in August 1949. Since World
War II, RAAF squadrons have served during the Korean War,
the Malayan Emergency and the Vietnam War (32). These
conflicts caused large fluctuations in the level of flying
training conducted by the RAAF.

Today the RAAF pilot training course has a duration of
a little over 12 months and is divided into five flying
phases. The two basic phases (60 flying hours total) are
taught at No 1 Flying Training School (1FTS) and the three
advanced phases (155 flying hours total) are taught at No 2
Flying School (2FTS) (13). 1FTS is located at RAAF Base
POINT COOK and operates CT4 Airtrainer propeller-driven
aircraft. 2FTS is located at RAAF Base PEARCE,
approximately 16 miles north of the city of Perth, Western
Australia, and operates Macchi MB326H jet trainers. A map
showing these locations is at Appendix A.

The RAAF trains pilots for the Royal Australian Navy
(RAN), Australian Regular Army (ARA) and the RAAF. RAN and
RAAF students complete the course described in the above
paragraph while ARA students undertake 120 flying hours at

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1FTS before completing their course on ARA fixed-wing or rotary-wing aircraft.

Student pilots enter the RAAF from a number of sources. These sources are as follows:

1. Direct Entry. Student pilots are recruited from the various walks of civilian life.

2. The Australian Defence Force Academy. Student pilots are recruited to attend the Australian Defence Force Academy where they complete undergraduate degree studies before commencing pilot training.

3. Serving RAAF Officers. Applications for pilot training are invited from serving General Duties (GD) Navigators and Engineering Officers.

4. Serving Airmen. Applications for pilot training are invited from serving airmen.

The minimum education standard required for pilot training in the RAAF is year-twelve (twelfth-grade) passes in Mathematics, English and two other subjects. If one of these two other subjects is not a physical science subject, then the applicant must have a pass in such a subject at year-eleven (14). The age limits at the commencement of flying training are 17 years minimum and 27 years maximum, with an upper limit of 19 years for entry via the Australian Defence Force Academy (14).

Officer Training. Officer training for direct entry and ex-airmen candidates is provided by RAAF College at RAAF Base Point Cook. These Junior Officer Introductory Courses

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run for 12 weeks and are completed prior to the commencement of flying training. Officer training for the candidates attending the Australian Defence Force Academy is provided during the three or four years of undergraduate degree studies.

Course Terminal Objectives for Pilots Course. The levels of performance required of students by the Course Terminal Objectives (CTO) contained in the pilots course are as follows:

1. Flying:

   a. Safely and effectively control the training aircraft solo by day and night

      i. throughout the normal flight envelope, and

      ii. in instrument flight conditions to precision minima.

   b. Safely and effectively control the training aircraft solo by day in close formation flight.

   c. Safely and effectively control the training aircraft following a system/sub-system failure.

   d. Execute the aircraft emergency drills applicable to the training aircraft.

2. Navigation:

   a. Safely and effectively navigate the training aircraft by day and night to the limits of the aircraft's safe range.

   b. Translate the morse code aurally at six words per minute in three letter groups.

3. Flight Planning and Operations:

   a. Plan flights and conduct operations in compliance with the appropriate air

traffic control, search and rescue and communications procedures.

4. <u>Aircraft Performance</u>:

    a.   Solve problems relating to aircraft performance.

5. <u>Aircrew Duties</u>:

    a.   Perform the general duties of a crew member of a RAAF aircraft.

    b.   Swim to the standard required for the award of the RAAF Swimming Proficiency Certificate.

    c.   Maintain a high standard of physical fitness by sporting activities and exercises including those required by current RAAF aircrew Categorization schemes.

6. <u>Maps and Charts</u>:

    a.   Use and interpret the navigational maps and charts in common use by the RAAF.

7. <u>Compass Systems</u>:

    a.   Calibrate the compass system fitted to the basic training aircraft.

8. <u>Instruments and Electronic Aids</u>:

    a.   Operate and interpret the instruments and electronic aids to navigation fitted to the training aircraft.

9. <u>Meteorology</u>:

    a.   Interpret synoptic charts and conduct flight planning and flying operations under varying meteorological conditions.

10. <u>Aviation Medicine</u>:

    a.   Display a knowledge of the aero-medical aspects of flight.

11. Aircraft Operations:

    a.   Display a knowledge of the use of air power in war (13).

General Issue

Functions and Roles of the RAAF.   According to RAAF

Publication JSP(AS) 101, the functions and roles of the RAAF

are as follows:

> The function of the RAAF is to conduct operations in the air for the defence of Australia and Australian interest. In the discharge of this function, the roles of the RAAF are to
>
>   1.   organize, train, and equip air forces for timely and sustained combat operations
>
>   a.   to defend Australia, its territories and its armed forces against attack,
>
>   b.   to undertake offensive air operations against enemy forces and installations,
>
>   c.   to control vital areas and to establish and maintain local air superiority as and where required,
>
>   d.   for air reconnaissance throughout the areas of operational interest
>
>   e.   for maritime operations including air and sea surveillance;
>
>   2.   provide offensive air support and tactical air transport to the Australian Services; and
>
>   3.   operate strategic air transport and provide other air transport support for the Australian Services (15).

The ability of the RAAF to to discharge its function

is directly dependent upon its ability to train personnel

to the required standards. This research effort locks, in

particular, at the ability of the RAAF to train pilots.
The long-term average failure rate for pilot training
courses in the RAAF is approximately 50 percent. However,
there have been large fluctuations from this figure, with
the failure rate for the last eight courses (as of mid
1986) at approximately 36 percent. Of those students who
fail, approximately 67 percent fail during the basic
phases, while approximately 33 percent fail during the
advanced phases (33). These historical failure rates could
be the result of either or both of the following factors:

1. poor selection of student pilots, or

2. problems encountered during the course that the
student pilots were not able to overcome.
The selection procedures are assumed to be sound for the
purposes of this research since the procedures for
selection are quite rigorous.

The RAAF cannot expect a zero failure rate during
flying training but every effort must be made to minimize
the failure rate since the cost of training a pilot in the
RAAF is approximately one million dollars. All RAAF
training, not only pilot training, is constantly under
review by the Directorate of Training - Air Force and the
Directorate of Psychology - Air Force to maintain standards
and to minimize unnecessary expenditure. In 1985,
representatives from the RAAF travelled to the United
Kingdom and the United States on a fact finding trip. They
met with members of the Royal Air Force and the United

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States Air Force to discuss air training matters and sought to identify aspects of each overseas training scheme that were appropriate for inclusion in the RAAF training scheme (33).

As part of the ongoing effort to minimize the cost of flying training, the Director of Psychology - Air Force, began surveying student pilots in August 1985 in an attempt to identify problem areas in the present flying training course (18). Problem areas identified by the survey responses would then be investigated and, if necessary, changes would be made in an attempt to reduce the failure rate of student pilots. For such an important project it is imperative that a valid survey instrument be used to thoroughly investigate the research area.

Research Objectives

The first objective of this research is to identify those factors in a pilot training course that could significantly influence the performance and progress of a student pilot.

The second objective is to establish the criteria for a valid survey instrument that will identify the factors causing poor performance and/or failure of student pilots.

The third objective is to ascertain if the existing survey instrument is effective in determining the extent to which student performance is influenced by the factors identified at the first objective.

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The fourth objective is to analyse and assess the value of the data collected using the existing survey instrument.

The fifth objective is, if necessary, to construct an improved survey instrument to better identify causes of failure in flying training and provide a basis to recommend improvements in the pilot training programme.

Research Questions

Specific questions related to the Research Objectives are as follows:

1. What are the factors that could significantly influence the performance and progress of a student pilot during flying training?

2. What constructs should be included in a valid survey instrument that seeks to establish which factors are causing poor performance and/or failure of student pilots in the RAAF?

3. Do the constructs of the existing survey fully investigate the influence of these factors?

4. What useful information can be extracted from the data contained in the existing survey?

5. If the existing survey is not adequate, what form should an improved survey instrument take?

Scope and Limitations

This study will attempt to determine those factors which could influence the performance of student pilots

during a flying training course in the RAAF. If the
already administered survey does not adequately investigate
the effect of these factors on student performance, then
some important information may not be available and a
replacement survey instrument will be developed. The
survey was administered to all students in each selected
pilots course. However, opinions of those students
suspended from training prior to the survey being
administered were not available.

Assumptions

For the purpose of this research, the researcher has
assumed that the procedures for selecting student pilots
from the list of candidates are sound and, therefore, all
students commencing a pilot training course in the RAAF are
assumed to be capable of completing the course.

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II. Literature Review

Chapter Overview

The functions and roles of the RAAF are stated on page 8. To support these functions and roles, the RAAF has developed a system to provide trained personnel capable of carrying out this mission. All RAAF training schemes are regularly reviewed to determine the effectiveness of each syllabus of training. This research effort is an outgrowth of a recent review and specifically examines the RAAF pilot training course. This literature review will seek to identify those factors that have a significant influence on the performance of student pilots during flying training. The review first examines the general aspects of education and training and then moves to the more specific education and training aspects of pilot training.

Education as a Management Process

Kaufman (24) postulated that the job of an educational manager is to plan, design and implement an efficient and effective learning system. He stressed the systems approach to education and defined the management of education as a six step process that included

1. Identification of priority needs and associated problems.

2. Determining requirements to solve the problem and identifying possible solution alternatives for meeting the specified needs.

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3.   Selecting solution strategies and tools from
      alternatives.

4.   Implementing solution strategies, including
      the management and control of the selected
      strategies and tools.

5.   Evaluation of performance effectiveness based
      on the needs and requirements identified
      previously.

6.   Revision of any or all previous steps (at any
      time in the process) to assure that the
      educational system is responsive, effective
      and efficient (24:12).

According to Kaufman, these six steps may be
considered a problem-solving process that forms the basic
process model for a systems approach to education (24:12).
Under Kaufman's process approach to the management of
education and training, this research effort is the
equivalent of performing step five above with respect to
the RAAF pilot training course.

Psychology Applied to Teaching

While Kaufman focused on the management of educational
programmes, other researchers have investigated the
specific cognitive aspects of teaching and learning.
Biehler (9), in his work, Psychology Applied to Teaching,
stressed the applied aspects of educational psychology.
The theoretical-deductive approach to problem solving is
important in the physical sciences, but when human
behaviour is studied, the empirical-inductive approach to
problem solving is appropriate. Humans are dynamic,
incredibly complex, often unpredictable and of infinite

variety. Because of this complexity, several psychological principles may be necessary in order to explain a particular type of human behaviour (9:5). Biehler emphasized that the broad categories of learning, motivation and evaluation could be used to explain the performance of students during a course of training (9:14). Therefore, an examination of these three concepts; learning, motivation and evaluation, with respect to the performance of student pilots during training, is appropriate to this research effort.

Learning

Kimble and Garmezy (25) defined learning as a relatively permanent change in behaviour that results from reinforced practice or experience (25:133). Luthans (28) expanded the concept of learning as follows:

1. Learning involves a change, though not necessarily an improvement, in behaviour. Learning generally has the connotation of improved performance, but under this definition bad habits, predjudice, stereotypes and work restriction are also learned.

2. The change in behaviour must be relatively permanent in order to be considered learning. This qualification rules out behavioural changes resulting from fatigue or temporary adaptations as being learning.

3. Some form of practice or experience is necessary for learning to occur. This qualification rules out behavioural change that is the result of physical maturation. For example, the ability to walk is largely based on physical maturation and would not be considered learning.

4.   Finally it should be stressed that the
      practice or experience must be reinforced in
      some way in order for learning to occur. If
      reinforcement does not accompany the practice
      or experience, the behaviour will eventually
      disappear (28:281).

Learning and Memory. Telfer, (Associate Professor and

Head of Department, Department of Education, The University

of Newcastle, New South Wales, Australia.) and Biggs, in

their book The Psychology of Flight Training (35) stated

that when humans learn any complex task, it is helpful to

distinguish three broad stages

1.   attending to the particular stimuli in an
      environment busy with activity,

2.   processing the information presented by the
      selected stimuli, and

3.   storing it so it can be used later (35:26).

Telfer and Biggs said that the three stages of

attending, processing and storing involve very different

time scales. In the sensory register, material is precoded

very quickly, according to its current importance to the

individual. Importance is "decided" according to various

sets of priorities which are determined by

1.   the ongoing plan of the individuals, which is

more or less a conscious choice of what they want to do,

2.   the physical attributes of the stimulus, their

intensity or variability, and

3.   the internal physiological states signalling

biological importance (35:33).

Working memory corresponds to span of consciousness. It may be regarded as an area in which information items or groups of information items (called chunks) are held while individuals think about them. If the information is not processed, by coding or rehearsal within about a minute, the information fades and cannot be recalled again (35:46). Research has shown that most healthy adults are able to hold approximately seven or eight chunks in working memory at any given time (35:46). Figure 1 is a pictorial representation of the three stages in learning and memorizing.
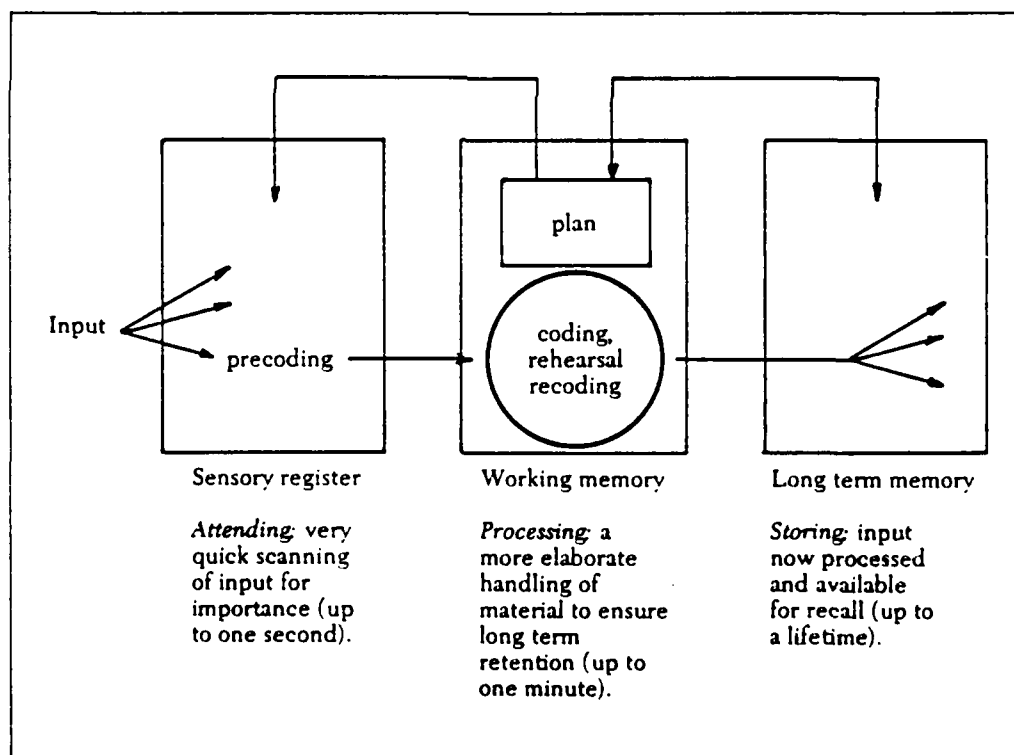
Figure 1. Three Stages in Learning and Memorizing
(35:28)

Telfer and Biggs further noted that experience or events associated with flight are either coded or rehearsed (or both) when they are committed to memory. Procedures, for example, are dismembered into

1. specific detail which is stored "raw" on the basis of rehearsal, and

2. several dimensions, which include

   a. semantic meaning (where words or mnemonics are the code),

   b. temporal sequence (in which chronological order is the code),

   c. logical structure (in which the logic of the sequence is the code), and

   d. spatial imagery (in which the pilot works systematically from left to right or in a clockwise direction through instruments and switches) (35:51).

Each of these dimensions has a different "home" in the brain. When the student pilot remembers, the total memory is reconstructed by assembling all the components around the specific details (35:51).

Teaching Space Saving Strategies. Working memory space is fixed (35:45). Problem solving requires working memory space, and more sophisticated problems require more space than simpler ones(35:45). The way to cope with sophisticated problems is by rehearsing problem solutions many times; thereby "chunking" the material so that it needs less space. Rehearsing problem solutions in this manner may then leave surplus working memory in which more aspects of the problem could be handled (35:45).

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In a training scenario, one solution to inadequate working memory space is to have the student or instructor analyse the problem, isolate those elements in the problem that make this demand, and then drill students in problem recognition and solutions, until the recall of these solutions becomes automatic. Working memory is particularly likely to be crowded when a student pilot is in a stressful situation, such as a sudden crisis in the air. Therefore for optimum problem response, the student's strategy is to have automatic (or chunked) responses to certain critical situations. Instructors can ensure greater likelihood of automatic responses for grouped procedures by subjecting the student pilot to repeated practice problems during flight (35:45).

The Three Stages of Learning to Fly. Telfer and Biggs applied the concepts of learning and memory to the act of learning to fly in the following manner:

1. Attending. In the flying situation pilots experience a huge variety of sensations. The number of things they could pay attention to is impossibly large. Pilots must select the right thing to attend to because, in the cockpit, recognition and maintenance of priorities is vital.

2. Processing. When pilots choose minds to attend to something, they have to do something with that information. They can rehearse it, by repeating it over and over again; or code it, by linking it to something they

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already know. Whether they code or rehearse, however, it is done consciously in working memory.

3. <u>Storing</u>. After processing, pilots need to store the information out of consciousness in long term memory in such a way that it can be recalled when required in future. Each of the above three stages requires that the information be held long enough for the process in question to be carried out (35:27).

<u>Teaching the Skills of Flying</u>. Telfer and Biggs stated that imparting skills is the central role of instructors in aviation (35:57). When a student pilot experiences a particular manoeuvre for the first time, individual actions necessary to complete the manoeuvre, may not be obvious. The student must be able to reproduce these actions with speed, accuracy and without conscious thought. The goal of the student pilot is to have the appropriate actions coalesce to form a skill (35:58).

Skills are developed in three stages:

1. <u>Cognitive Stage</u>. At this stage the student is acquainted with the task and what is required but may not be able to perform the task.

2. <u>Fixitive Stage</u>. During this stage the student goes through the procedure, at first slowly and laboriously, so that the sequences and movements are fixed in his mind.

3.   Autonomous Stage. In this stage the student

practices the whole skill by himself until it becomes

virtually automatic (35:58).

Some Conditions of Skill Learning. Telfer and Biggs

associated the following four conditions with the learning

of flying skills:

1.   Rehearsal. As far as skills are concerned, the

transfer of material from the short term to the long term

memory is achieved by means of rehearsal. Aircraft

emergency actions, for example, need to be rehearsed again

and again until the whole sequence of actions can be run

off automatically and correctly by the individual (35:61).

2.   Feedback. Skills cannot be learned by rehearsal

alone. A student must know if what he is doing is correct

or incorrect; and if incorrect in what way. The provision

of this feedback is the flight instructor's primary

responsibility in skill learning. Feedback can be of two

types:

a.   Extrinsic Feedback. Extrinsic feedback is

provided from a source external to the student. An example

of extrinsic feedback is when the student is given an

evaluation of his performance by an instructor. The flight

instructor is most effective when he provides feedback

during a lesson instead of waiting until the flight is over

(35:61).

b.   Intrinsic Feedback. Intrinsic feedback is

independent of an outside agent and is apparent to the

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student through the results of his own actions. This type of feedback is the preferred type during training processes because it is the most convincing and requires no outside agent (35:62). The limitation is that the student can perceive results, not necessarily the actions leading to the results (35:62).

3. **Whole Versus Part Methods**. One important issue in the teaching of skills appears to be the whole versus part question. Should a student rehearse the whole sequence each time from beginning to end, or should he be taught segments of the skill and then learn how to join these segments together? At the cognitive stage of skill learning, it seems necessary to give the student an idea of the whole skill so that he may gain an overall view of what is required. At the fixative stage the student may be able to perform some parts of the skill well but experience difficulty with other parts. The student should rehearse more often those segments of the skill where he is weak. At the autonomous stage the whole skill should be rehearsed (35:63).

4. **Massed Versus Distributed Practice**. Another issue in skill learning is whether students should be given massed amounts of practice or have the practice spread over many days. The nature of the skill and the demands it makes on the student are factors that should be considered by the instructor. The instructor must balance possible decreased rates of learning due to fatigue from many

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lessons against possible decreased learning rates due to the student forgetting between practice sessions (35:64).

Motivation

Even with an understanding of how students learn, remember and aquire skills, there remains the problem of why some students seem to have a much greater desire to learn than other students. Motivation is the key to arousing the interest of students (9:313).

Berelson and Steiner (8) defined motivation as "all those inner-striving conditions described as wishes, desires, drives, etc... It is an inner state that activates or moves" (8:239). According to Donnelly, Gibson and Ivancevich (17), motivation involves effort, persistence and gcals (17:309). There are a number of theories to describe motivation and the more important theories are reviewed in the following paragraphs.

Theories to Describe Motivation. The theories which describe motivation are commonly placed into two general groups: content theories and process theories. Content theories are those theories of motivation that are concerned with the identity of what specific things within an individual or the work environment energize and sustain behaviour (17:341). Process theories, in contrast, attempt to explain and describe the cognitive processes by which behaviour is energized, directed, sustained and stopped (17:311).

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Two important content theories of motivation are
Maslow's (30) needs hierarchy theory and Herzberg's (22) two
factor theory. Maslow arranges five needs in an hierarchy
based on different levels of importance. The levels are
physiological needs, safety needs, social needs, esteem
needs and self actualization needs. Herzberg presents two
sets of job conditions: maintenance factors and motivational
factors. The maintenance factors are external to the job
and cause dissatisfaction when they are not present. The
motivational factors are job centred and tend to motivate
individuals (17:338).

Vroom's (37) expectancy theory of motivation is an
example of a process theory. Vroom suggested that "the
choices made by a person among alternative courses of action
are lawfully related to psychological events occurring
contemporaneously with the behaviour" (37:14). More simply,
the motivation to work or act is the product of expectancy,
instrumentality and valence (or preference), where
expectancy is the belief that a particular behaviour will or
will not be successful, instrumentality is the probability
assigned to the performance-outcome link by the person, and
valence/preference is the value attached by the person to
the various possible outcomes (17:334).

Reinforcement theory is another widely discussed
process theory of motivation. Reinforcement theory is
concerned with the environment and its consequences for an
individual (17:338) and considers the use of positive and

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negative reinforcers to motivate or create an environment of
motivation (17:324). The explanation of reinforcement
theory centres on Thorndike's "law of effect" which states
that

> behaviour that results in a pleasing outcome will
> be likely to be repeated; behaviour that results in
> an unpleasant outcome is not likely to be repeated
> (36:244).

Luthans and Kreitner (27) described the various forms of
reinforcement as follows:

1. <u>Positive Reinforcement</u>. Positive
    reinforcement is one of the most firmly
    established laws of learning. As the term
    suggests, positive reinforcement strengthens
    behaviour. A positively reinforced response
    has a greater probability of recurrence simply
    because it pays off (27:47).

2. <u>Negative Reinforcement</u>. Negative
    reinforcement is both like and unlike positive
    reinforcement and is often confused with
    punishment. It is like positive reinforcement
    in that it increases the frequency of a
    response but unlike positive reinforcement in
    that its reinforcing properties come through
    the contingent termination or withdrawal of
    some condition (27:47).

3. <u>Punishment</u>. A response is punished when the
    contingent presentation of an environmental
    condition decreases its frequency of
    occurrence (27:48).

4. <u>Extinction</u>. Responses that are no longer
    reinforced decrease in frequency and
    eventually disappear (27:48).

<u>Motivation and Arousal: General Determinants of</u>
<u>Behaviour</u>. Telfer indicated that motivation may be
considered at two levels: the general drive to behave and
the particular acts that one is specifically motivated to
perform (35:72).

The Concept of Arousal. Telfer and Biggs point out that the concept of arousal is the key to understanding the general level of motivation. Figure 2 introduces a fourth element, the arousal system, to the memory system depicted in Figure 1.
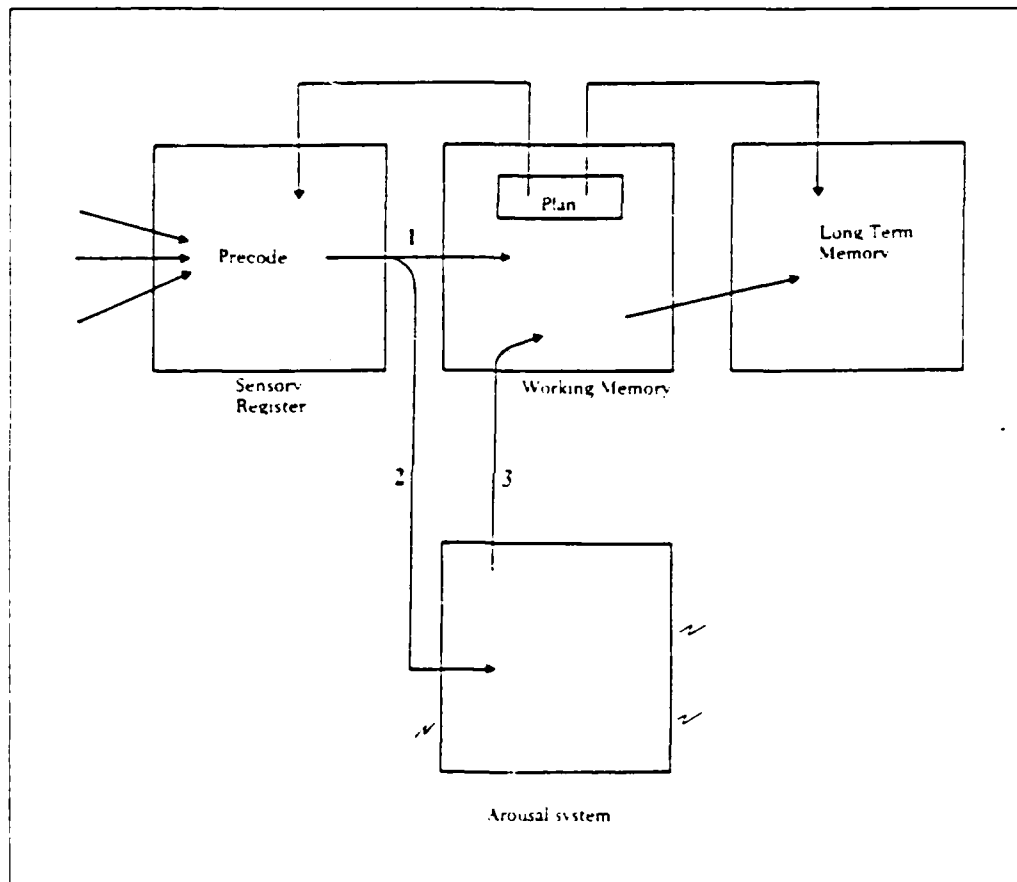
Figure 2.   The Relation Between Arousal and Information
            Processing Systems   (35:73)

The arousal system is linked with both the sensory register and working memory. These links have a crucial effect on mental processes, particularly from the first moment an

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individual pays attention to something. When something has been precoded as important, the message regarding that item goes straight to working memory for further processing. The arousal system is also triggered by the precoded signal and it is this boost to arousal that motivationally distinguishes important from unimportant messages (35:74).

Telfer and Biggs said that the arousal system affects working memory in four ways:

1.   The Orienting Response. In this mechanism some messages are more likely than others to be precoded as potentially important. Any variation from the current input messages will be recognized as important because something different is happening. Response to unusual input messages is called orienting response, because the individual becomes oriented to a new and, perhaps important event (35:74). Figure 3 shows how input messages come from all or any of an individual's sense organs and take two routes to the brain. The first route is through the cortex, where the message is interpreted, sorted, and used in cognitive processes such as decision making and problem solving. The second path is to the reticular arousal system which increases the individual's readiness for general activity (35:74).

2.   The Energizing and Interfering Effects of Arousal.   When the arousal system is stimulated, as

SENSES

Touch

Sight

Hearing ——————— Sensory input

Taste

Smell

Cortical processes
energised and
performance
enhanced

Recticular
Arousal
System
(R.A.S.)

To autonomic nervous
system (which governs
emotional responses:
sweating, heart rate,
withholds digestion, etc.)
which can detract from
performance.
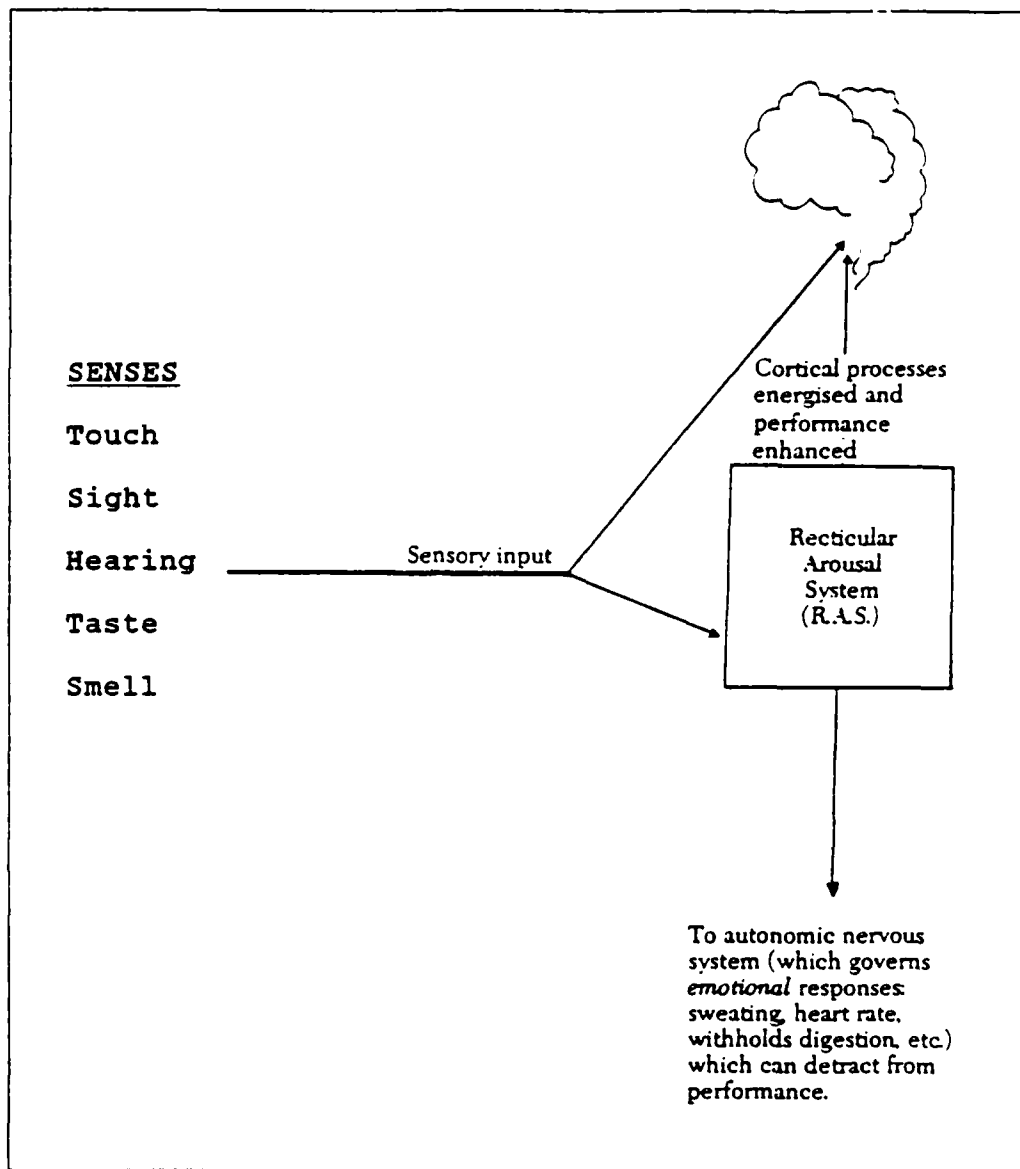
Figure 3.   Energizing and Interfering Effects of
            Arousal   (35:75)

happens in the orienting response, two effects are

generated:

        a.   Cortical processes are directly energized to
            cope more efficiently with the message which
            has already been received.

b. The autonomic system is activated to release
adrenalin to the blood stream. The ensuing
bodily changes are useful for emergency
action requiring the immediate expenditure
of lots of energy (35:76).

Most stressful situations do not require humans to fight or

flee. A high level of physical arousal must be

accommodated by an individual so that increased arousal

does not interfere with effective performance. Arousal,

therefore, is expected to have two effects on humans: an

energizing effect, which enhances performances; and, beyond

an optimal point of arousal, an interfering effect, which

may detract from performance (35:76).

3. The Relationship Between Arousal and Performance.

The general relationship between arousal and performance

can be represented as an inverted U curve as shown in

Figure 4. Krohne and Laux (26) stated that, according to

Hebb (20), the inverted U curve is the best known model

relating arousal to performance (26:76). At very low

levels of arousal, performance is poor. As arousal

increases, performance improves up to an optimal point,

after which performance deteriorates with increasing

arousal (35:78).

4. The Relationship Between Arousal, Performance and

Task Complexity. The Yerkes-Dodson Law (41), formulated in

the early part of this century and depicted in Figure 5,

states that simple tasks are performed better under higher

degrees of motivation or arousal, while complex tasks are

performed better under low degrees of motivation or
arousal (35:79).
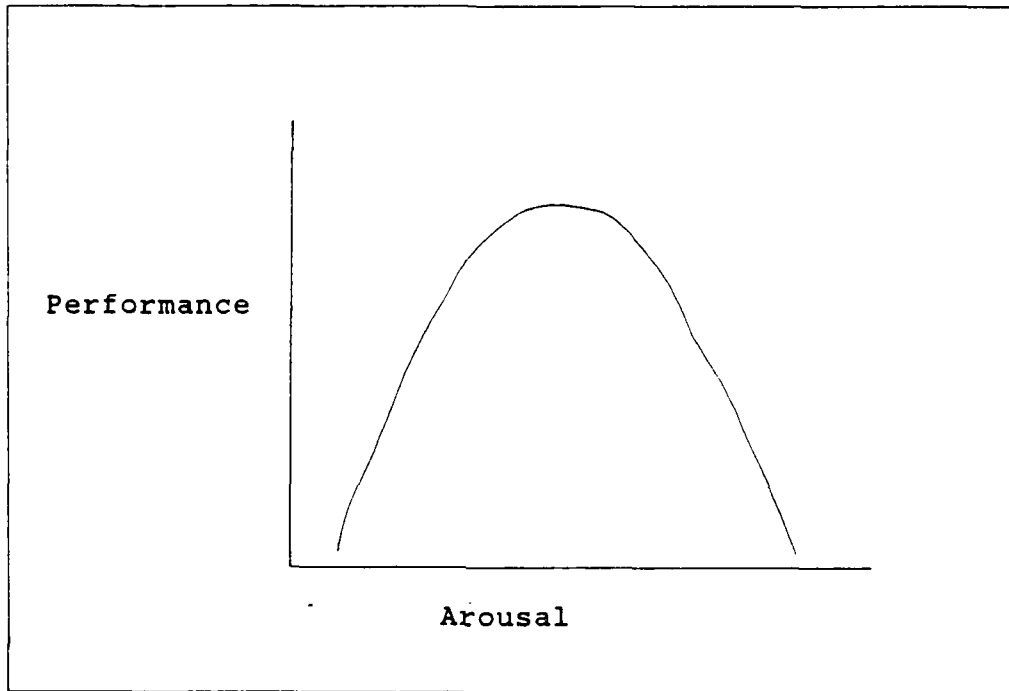
Figure 4. The General Relationship Between Arousal
and Performance   (23:78)

When performing a simple task, a person can operate
efficiently at much higher levels of arousal than if the
task were relatively more complex. The degree of task
complexity affects the amount of working memory that the
person needs in order to perform the task satisfactorily.
Simple tasks require little working memory, complex tasks
somewhat more.

Researchers have shown that if memory load, while
performing a task, can be lessened then task performance
improves. Reduced memory load helps alleviate the

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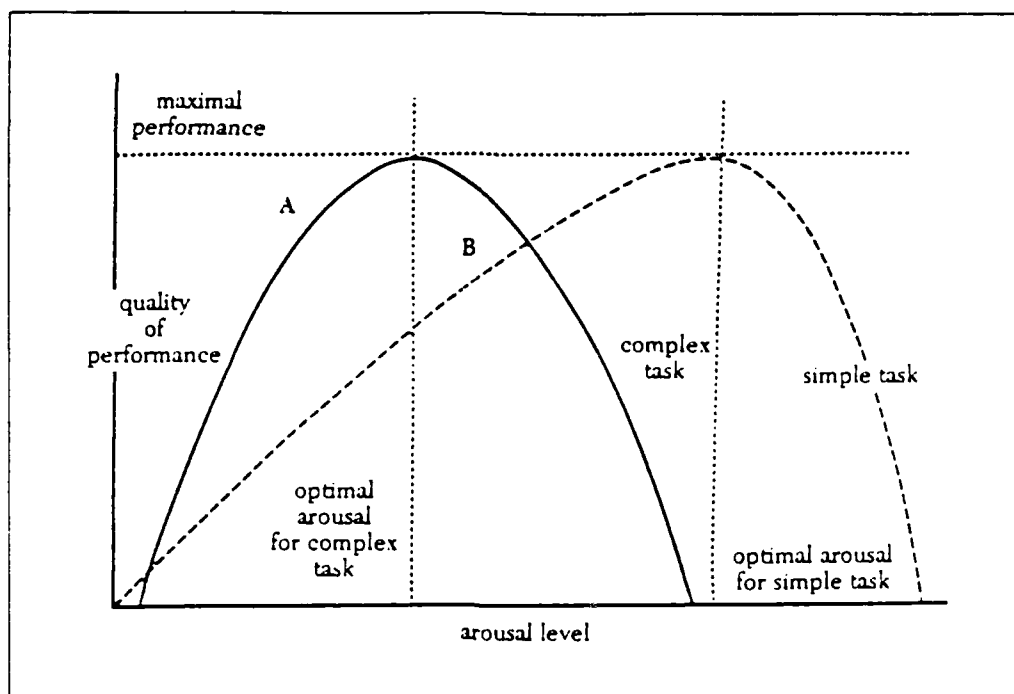
Figure 5. Arousal and Task Complexity (35:79)

interfering effects of anxiety, particularly for complex

tasks (35:79). Rote learning, mnemonic devices and

rehearsal of the skills to be practiced, help student

pilots free working memory space (35:35,39).

<u>Arousal and Flight Instruction</u>. The previous

paragraphs have shown how performance can vary with

arousal. At a very low level of arousal, performance is

poor. As arousal increases, performance improves up to an

optimal point (energizing effect), after which performance

deteriorates with increasing arousal (interfering effects)

(35:78). Flying instructors must strive to arouse students

in order to improve student performance but stop short of

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arousal levels where interfering effects are manifested as decreasing quality of student performance (35:78).

Flying instructors should commence instruction with easy, basic tasks and gradually increase the complexity of the tasks; all the while monitoring student performance to ensure the quality of this performance does not begin to decrease. For example, in preflight briefing the instructor should test student knowledge by beginning with gentle probing and moving onto more complex questions (35:78). In the air, the instructor should begin with basic flying sequences and then build upon and join these to form a more complex manoeuvre. For example, climbing, straight and level flight, turning, and descending are required basic skills to fly circuits and landings at an airfield.

The Motivation and Self Concept of Student Pilots. Telfer and Biggs began their treatment of the motivation and self concept of student pilots with the question, "Why do people want to learn to fly aircraft?" Telfer and Biggs then provided a two part answer to their own question:

1. "Because it is a necessary step in achieving something else the person wants," or

2. "Because flying is enjoyable" (35:95).

These two reasons are not mutually exclusive. The first reason for wanting to fly is representative of Vroom's extrinsic motivation. Flying is seen as providing a means of achieving a pay-off such as material gain, social

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approval or ego enhancement. The second reason for learning to fly is indicative of Vroom's intrinsic motivation factor. The pay-off for the individual takes the form of an inner feeling of well being, for example, the enjoyment gained from flying (35:95).

Extrinsic Motivation Applied to Flight Training. Telfer and Biggs discussed four aspects of extrinsic motivation with respect to flight training. They first described classical conditioning effects. A classical conditioning response is evident in the case of the over-anxious and timid student pilot who needs to be given the opportunity of associating other emotions with the experience of flying. For example a flight instructor may deliberately present a flying experience to the student which is likely to have pleasurable associations; such as, the view of a lush river valley nestled between two scenic ridge lines. Otherwise, the stimuli (flying sequences) may become associated with an inappropriate flight emotion such as lack of confidence or nausea. Punishing students by setting additional ground school assignments, for example, may lead to apparent "irrational" dislike for ground school by students (35:96).

Secondly Telfer and Biggs related the concept of operant conditioning to flight instruction in the following way. To inculcate desirable behaviour (such as good airmanship techniques) and to discourage undesirable flight behaviour, flight instructors may choose from the four

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alternatives (defined previously on page 24 and taken from Luthans) of positive reinforcement, negative reinforcement, extinction and punishment with the following consequences (35:96):

1.   Positive Reinforcement. The positive reinforcers can be verbal - "nice landing" or non verbal - a nod of assent or a praising glance. The non verbal reinforcers can be more powerful than verbal reinforcers. In flight instruction, the value of positive reinforcement depends upon the relationship between the instructor and student. If the student neither likes nor respects the instructor then praise can be perceived as unpleasant or patronizing. The Premack Principle, named for psychologist, David Premack, suggests that a preferred activity (such as flying an aircraft) provides a very effective means of reinforcing a less-preferred activity (such as learning checklists and procedures) (35:98).

2.   Negative Reinforcement. Techniques of negative reinforcement have a weakness; they generate anxiety (35:97). A student pilot, anxious over one or two small items that he may miss during a flight, may come to associate anxiety with a particular air exercise or flying in general (35:97).

3.   Extinction. Unlike other training forums, flight instruction may not be able to incorporate extinction techniques of reinforcement. Recall that extinction means that the instructor will ignore a response. However,

ignoring a response in pilot training can have catastrophic effects. For example, a forgotten checklist item before takeoff may create an intolerable condition for unsafe flight (35:98).

4. Punishment. In aviation, self discipline is the ultimate goal because much of the time a pilot's actions in the air are unsupervised. The onus is on the student to achieve this goal with the instructor there to guide and assist the student in developing good airmanship (35:98). Therefore, the use of punishment as a way to modify student behaviour rarely has a place in a flying school.

Telfer and Biggs have described the extrinsic effects of social motivation on student pilots in the following way. One of the most powerful sources of influence on a person's behaviour is another person. This effect is consistent with experiments conducted by Cline and Richards (11) which showed that individuals receive and strongly acquire communications from role-senders (23:202). The student pilot is strongly influenced by the pilots (role models) with whom he associates. Given that non verbal behaviour is more easily modelled than verbal behaviour, flight instructors have a psychological as well as a moral responsibility to practice what they preach (35:100).

Telfer and Biggs next applied McClelland's theory of motivation (29) to the flying training arena and described motivation generated by an individuals need to achieve as being part intrinsic and part extrinsic. Two major

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motives, defined by Atkinson (2), are the need to achieve

success and the need to avoid failure (2:240). Low need-

achievers are expected to be more motivated to avoid

failure than to achieve success, while high need-achievers

are expected to be more motivated to achieve success than

to avoid failure (35:100). High and low-need achievers

contrast in their persistence at key stages of flight

instruction, such as final preparation for solo or

instrument flight. The relative contributions of the

student's need to achieve success, and his need to avoid

failure, are crucial determinants of a flight instructor's

response to students who are not achieving as they should

(35:100).

Intrinsic Motivation Applied To Flight Training.

Bandura's (5) social learning theory emphasises the

cognitive activity of the learner. Bandura added two self-

system concepts to his social learning theory to help

explain intrinsic motivation. These were self-

reinforcement (7) and self-efficacy (6). Arkes and Garske

(1) summarized Bandura's concept of self-reinforcement by

stating that an individual can motivate himself via

1.   self-observation -- the individual monitors and

evaluates his own performance,

2.   judgemental processes -- the individual selects

and applies some standard of performance to himself,

3.   self-response -- the individual matches

performance to the self imposed standards and then rewards

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or punishes himself depending on the outcome of his match-
up (1:210).

Arkes and Garske further stated that Bandura's concept
of self-efficacy (personal expectation of performance) is
needed to explain the importance of the self-reinforcement
concept. An individual's self-efficacy, determines the
individual's level of motivation to perform a particular
task (1:210). Four sources of information influence an
individual's self-efficacy. Performance accomplishments
affect efficacy expectations through the belief of success
(35:104). Vicarious experiences affect expectations when
an individual expects to be able to accomplish a task after
observing a demonstration of the task (1:210). Verbal
persuasion involves prompting, coaxing and praising
(1:210). Emotional arousal can affect expectations of self-
efficacy where fear and anxiety decrease efficacy
expectations (1:210). Of these four influences,
performance accomplishments appear to be most effective in
strengthening efficacy expectations (1:210).

Attribution Theory. Telfer and Biggs stated that, in
the formation of a student's efficacy beliefs, it is
important that the student attributes success or failure to
causes that will motivate future performance, rather than
causes discouraging further involvement (35:104). Weiner
(38) defined two dimensions to describe a student's
judgements about attribution for performance; stability
(stable/unstable - likely to recur versus unlikely to

recur) and locus (internal/external or intrinsic factor

versus extrinsic factor) (35:105). Weiner showed how four

possible attributions could be made using these two

dimensions, and defined the four possible attributions as

ability (stable/internal), task difficulty

(stable/external), effort (unstable/internal) and luck

(unstable/external) (1:341). These four possible

attributions are displayed in Figure 6.

	Internal	External
Stable	Ability	Task Difficulty
Unstable	Effort	Luck

Figure 6.   Possible Attributions   (1:341)

Fiske and Taylor (19) showed how other investigators

introduced a third dimension, controllability, to help

understand the implications of causal analysis (19:47).

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The controllability of an outcome is important for
understanding emotions (19:50). This controllability
dimension relates to whether or not a person has control
over the achievement outcomes of success or failure
(19:51). Attributions lead to emotions that then help
determine future performance (39). Therefore, people often
use the dimension of controllability as a basis for
evaluating someone or offering a person help (19:51).
Fiske and Taylor presented the three dimensions of
achievement behaviour; stability, locus, controllability
and examples of what could cause each kind (19:50). Here
is a summary of the possible causes of achievement outcomes
using these three dimensions:

Controllability	Stability	Locus	Possible Cause
controllable	stable	internal	typical effort exerted
		external	some forms of teacher bias
	unstable	internal	* temporary effort exerted (for this task)
		external	unusual help from others
uncontrollable	stable	internal	* ability
		external	* task difficulty
	unstable	internal	mood
		external	* luck

(19:50)

Note: The four possible causes indicated by asterix are
the same as in Figure 6.

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Attributions can be made by a student after either failing or succeeding at a task. Upon failure, the most damage is done to a person's self-efficacy if they attribute that failure to their own low ability (35:105). Instructors should therefore attempt to avoid contexts that could lead the student to make this type of attribution. Examples of potential precursors of low ability attribution by a student are criticism (other than constructive), sarcasm or comparison with others after failure. Attributions to stable factors (ability or task difficulty) decrease future expectations of success and hence motivation (35:105). The general implications of attribution theory are such that; appropriate attributions of success to ability, and of failure to lack of effort, are likely to motivate an individual to future achievement. Attributions of success to luck, or to an easy task, and failure to lack of ability, are likely to kill subsequent interest in the tasks that achieve this effect (35:106).

Telfer and Biggs have summarized the various sources and types of motivation by using a continuum which ranges from "pure" extrinsic to "pure" intrinsic motivation. Figure 7 depicts this continuum and shows the increase in an individual's feeling of competence as motivation becomes more intrinsic (35:99).
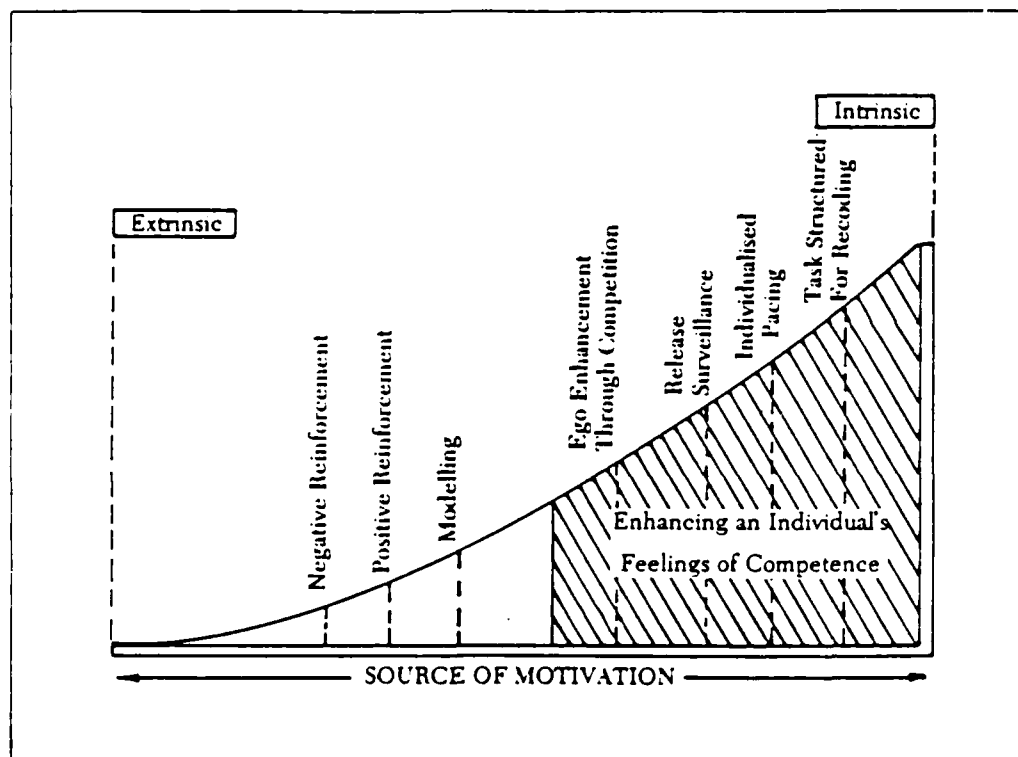
Figure 7.   Student Motivation and Self Concept   (35:95)

Evaluation

Biehler stated that evaluating is necessary so that student performance can be judged (9:373).   Student performance is dependent upon

1.   the meaningful interaction between student and instructor (feedback),

2.   what the student knows and does not know prior to the commencement of instruction,

3.   what is misunderstood by the student,

4.   the use of hypothesis testing in improving problem analysis skills,

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5.   the setting of specific goals to develop
realistic aspirations in students, and

6.   the ability of an instructor to detect gaps in a
student's knowledge (9:373).

Evaluating the performance of students is a primary
responsibility of an instructor (9:374).

Student Criticisms of Tests and Grades. Biehler
showed that students criticised tests and grades for a
number of reasons. First, students complained that too
much emphasis is placed on tests and grades, which limits
creativity and individuality of expression. Second, tests
and grades are said to put too much pressure on students.
Third, information learned for a test is only a means to an
arbitary end - a grade. Fourth, instructors are too
authoritative, with students forced to repeat what the
instructor says (9:374).

Potential Advantages of Tests and Grades. Biehler
argued that there are potential advantages of tests and
grades (9:381).

1.   Evaluation provides feedback, which often
      functions as reinforcement, which in turn is
      an essential part of learning.

2.   Tests and grades help guarantee that a student
      will master basic facts and skills en route to
      mastery of concepts and general abilities.

3.   In studying for exams, students usually over
      learn. Such over learning helps assure that
      material will be remembered.

4.   Exams require students to try out their ideas
      under rigorous circumstances that limit
      "fudging".

5. Tests and grades may be the only, if not the best, way to get many students to learn many important things.

6. Capable students often thrive on competition. Tests and grades may inspire them to work closer to their capacity.

7. Grades and test performance provide a detailed analysis of the strengths and weaknesses of students (9:381).

Testing. Biehler stated that if evaluation is to produce the advantages listed above, the tests and other measures of performance must meet two basic criteria:

1. Are the measures of performance valid? Do they measure what they are supposed to measure?

2. Are the measures of performance reliable? Do they yield consistent, dependable scores? (9:383)

Some Basic Concepts in Evaluation. The following material is extracted from the work of Telfer and Biggs as they applied the concepts of evaluation to flight instruction. In some flight instruction, learning and evaluation are two sides of the same coin; evaluation is necessary to determine the course of future learning or the remediation of previous learning. In other flight instruction situations, evaluation and learning are sometimes believed to be in conflict, where evaluation stifles learning or performance, for example, test-anxiety (35:110).

Tests and Flying. A test is an instrument for measuring education outcomes (35:110). Bloom's (10) Taxonomy Of Educational Objectives: Cognitive Domain lists

six major classes of learning:

Knowledge - Can students recall information?

Comprehension - Can students explain ideas?

Application - Can students use ideas?

Analysis - Do students see relationships?

Synthesis - Can students combine ideas?

Evaluation - Can students make judgements? (9:382)

During ground instruction, all six levels of learning are evaluated. Once in the air, tests are usually conducted to measure abilities or achievement. Cognitive tests can be either instruction-free or instruction-dependent. Instruction-free tests measure performances that are relatively free from the effects of instruction: they are ability tests that characterize the person, and include measures of general abilities. Instruction-dependent tests evaluate how well students have learned particular bodies of knowledge or skills which have been the subject of instruction (35:110).

Formative and Summative Evaluation. Formative evaluation provides feedback to both instructor and student, and is used in the teaching process; summative evaluation indicates how well material has been learned after teaching has been completed. Formative evaluation is continuous. diagnostic and remedial, while summative is terminal, finite and descriptive (35:111).

Norm-Referenced Evaluation. Norm-referenced measures
are interpreted according to the performance of an
individual in relation to others (35:111).

Criterion-Referenced Evaluation. Criterion-referenced
tests are those which yield measurements that are directly
interpretable in terms of specified performance standards.
The individual is evaluated in terms of some prescribed
standard irrespective of the performance of other
individuals (35:115).

Practical Tests. Here the student is put in a
practical situation that is identical to the behaviour that
will be required of him when instruction has ceased.
Therefore, this form of criterion-referenced evaluation is
the only logical way of evaluating flight instruction
(35:123).

Importance of the Flight Instructor. A flight
instructor is the greatest single variable affecting a
student pilot's learning. There is ample evidence of this
claim in the results of research in both aviation and
education. A single definition of good flight instruction
is unavailable because, among researchers, there is little
agreement on what constitutes successful flight instruction
(35:169). If the task of assessing flight instruction is
to be undertaken, it could best be done by using a
multidimensional approach which considers student
achievement and the means used to facilitate it (35:170).

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Summary

The purpose of this literature review was to establish those factors that could significantly influence the performance of student pilots during flight training. This research will adopt a systems approach and treat the RAAF pilot training scheme as a sub-system of the larger RAAF training system, which in turn is a sub-system of the larger RAAF operation.

Training is a process controlled by a manager who must plan, design and implement an efficient and effective learning system. Flight training is taught on a one-to-one student to instructor ratio. Therefore, the psychological aspects of instructing have an enormous impact on students.

Student pilots are mature adults who undergo a rigorous selection procedure. Using Biehler's view (9), the broad aspects of training that affect a student's performance are learning, motivation and evaluation. These broad aspects, applied to pilot training, can be further defined as follows:

1.   Learning. The learning factors affecting student performance include

          a.   the standard of instruction,

          b.   the methods of instruction,

          c.   learning practices employed by students, and

          d.   the amount of instruction given to students in how to learn and study.

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2.   Motivation. Motivational factors affecting student performance include

a.   the level of student motivation,

b.   the level of student/instructor relationships,

c.   student understanding of training objectives, and

d.   the standard of physical working and living conditions.

3.   Evaluation. Evaluation factors influencing the performance of students include

a.   feedback to students of ground school and flight results, and

b.   the conflict between preparation for ground school tests and preparation for flights.

III. Methodology

Chapter Overview

This chapter describes the methods that were used to achieve the Research Objectives. Also described are the population from which the data was collected, the already administered survey, the statistical procedures that were used to process the data and the method used to construct an improved survey instrument.

Factors Influencing Performance

Identification of those factors that have a significant influence on the performance of student pilots during flying training was accomplished by

1. a review of the literature,

2. an analysis of completed surveys, and

3. application of the author's six years of experience as a Qualified Flying Instructor (QFI) in the RAAF.

Population

Data was collected from student pilots in pilots courses No 133 to No 138 inclusive. A summary of the surveys collected appears at Table I.

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TABLE I.

Summary of the Number of Surveys Collected

Course Number	Flying Phase Completed	Number of Students
133	5	20
134	5	24
135	5	19
136	5	18
137	2	27
137	5	20
138	2	24

Survey Data

The survey data was collected by The Director of Psychology for the RAAF during 1985 and 1986. The data was in the form of the original completed surveys. Optical scan answer sheets were not used when the survey was administered.

Analysis of the completed surveys was carried out in the following manner:

1. An item analysis on the existing survey instrument was performed.

2. Appropriate measures that were theoretically and conceptually sound, were developed where necessary.

3.   A data analysis using the measures developed at steps 1. and 2. was performed.

Development of Measures

The given survey instrument contained numerous open-ended questions. It was necessary to translate these responses into meaningful categories. The number of categories was kept sufficiently large in order to maintain high detail in the coded data (3:192).

To code the data, the researcher reviewed the responses to each open-ended question. The code categories chosen were exhaustive but unfortunately were not mutually exclusive as suggested by Babbie (3:193) because of the very nature of replies to open ended questions. Depending upon the repondent, answers ranged from very general to very specific and were therefore not mutually exclusive. The chosen code categories were validated using an experienced AFIT faculty member expert in the field of survey construction and analysis.

Internal Validity Assessment

Approximately ten percent of the surveys were selected at random for an internal validity check. An individual external to the research effort checked both the appropriate coding of responses to the open ended questions (using the developed measures) and correctness of data entry into the computer data file.

Statistical Analysis

Statistical analyses of the data from the existing survey was carried out using the Statistical Package for the Social Science version ten (SPSSx), Release 2.1 for VAX and UNIX (34). The individual SPSSx procedures used for data analysis are described below.

Frequencies. The FREQUENCIES procedure was used to determine the basic distributional characteristics of each of the variables used in the subsequent statistical analysis (31:181). An initial examination of the frequency distribution tables generated by the procedure allowed the researcher to ensure that each variable had sufficient variability to be used in subsequent relational analysis. Furthermore, it permitted the researcher to check the validity of the data to ensure that it had been coded and input to the desired specifications (31:182).

Correlation. The PEARSON CORR procedure was used to generate Pearson product moment correlation coefficients for all pairs of variables. The caution given by Nie, et al, regarding the use of Pearson correlation coefficients (and other statistics originally designed for interval level variables) was noted (31:276).

Crosstabulation. The CROSSTABS procedure was used to construct crosstabulation tables (31:218). A crosstabulation is a joint frequency distribution of cases according to two or more classification variables. These joint frequency distributions were analysed using

1.   the <u>Chi-Square</u> statistic to determine whether a systematic relationship existed between two variables (31:223), and

2.   the <u>Phi</u> or <u>Cramer's V</u> statistic (depending on the dimensions of the crosstabulation table) to measure the strength of relationship between variables (31:224).

<u>T - Tests</u>.   The T-TEST procedure was used to compute Student's t and probability levels for testing whether or not the difference between two sample means was significant.   Cases were classified into two groups (independent samples) and a test of mean differences was performed for specified variables (31:267).

Construction of Improved Survey Instrument

Based on the analyses of the given surveys, it was considered necessary to construct an improved survey instrument.   The researcher chose to describe an improved survey instrument in general terms and produce a rough outline of such an improved survey instrument.   Readers should be mindful that the rough outline requires considerable upgrading to turn it into a quality instrument.   The researcher took the following basic steps described by Helmstadter (21) to construct the new survey outline:

> The first step of any questionnaire study is that of translating the stated general purpose of the study into the specific information needed from the individual subject.   The researcher must write out in detail exactly what information is needed to answer the questions raised by the research problem (21:72).

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The next step is that of preparing the actual questionnaire that will be used (10:72). The researcher should then proceed along the following path:

1. The investigator should keep in mind, when writing each item, that the major purpose of the questionnaire is to translate the research objectives into specific information.

2. The language used must be gauged to both the level of the group to be surveyed and the precision of the data needed.

3. The writer must take into account the frame of reference of the respondent.

4. The information level of the respondent must be kept in mind.

5. The social acceptability of the possible alternative answers must be considered.

6. Leading questions must be avoided.

7. Each question should be limited to a single idea.

8. It is usually best to arrange the sequence of questions from the more general to the more specific.

9. The questionnaire should be pretested (21:73).

The third step is the selection of the respondents to be contacted and the fourth step is the analysis and interpretation of the data (21:75).

The researcher used the United States Army

Questionnaire Construction Manual, prepared by Babbit and

Nystrom (4), as a reference for the following areas of

survey construction:

1. Instructions to respondents.

2. Anonymity of respondents.

3. Wording of items.

4.   Questionnaire format.

5.   Number of response alternatives.

This new survey outline (copy at Appendix E) was constructed with the assistance of experts from the AFIT faculty.

IV. Analysis and Discussion

Chapter Overview

This chapter examines those factors that could significantly influence the performance and progress of student pilots and what criteria should be included in a valid suvey instrument to investigate the degree of influence of these factors. Next, the given survey is discussed with regard to its effectiveness in investigating these factors along with an assesssment of the data contained within the given survey. A new survey outline was constructed and this is described along with suggested courses of action for future research.

Factors Infuencing the Performance of Student Pilots

The review of the literature in Chapter II showed that there were three broad factors influencing the performance of students. These are learning, motivation and evaluation. These broad aspects, when applied to pilot training, were further defined at the end of Chapter II and are repeated as follows:

1. Learning. The learning factors affecting student performance include

      a. the standard of instruction,

      b. the methods of instruction,

      c. learning practices employed by students, and

d.   the amount of instruction given to students
in how to learn and study.

2.   <u>Motivation</u>. Motivational factors affecting
student performance include

a.   the level of student motivation,

b.   the level of student/instructor
relationships,

c.   student understanding of training objectives,
and

d.   the standard of physical working and living
conditions.

3.   <u>Evaluation</u>. Student performance is influenced by
the following aspects of evaluation

a.   feedback to students of ground school and
flight results, and

b.   the conflict between preparation for ground
school tests and preparation for flights.

A valid survey should investigate all these factors
thoroughly. A statistical analysis of the results should
show the researcher if any or all of these factors have a
significant influence on the performance of student pilots
during flight training.

General Comments on the Given Survey

The given survey contained some very useful information
but, unfortunately it was not in a form that lent itself to
statistical analyses of any power. The open-ended question

was the culprit. Before the problems with the open-ended

questions are described in more detail, it must be noted

that the open-ended questions produced information that was

extremely useful in developing a survey that would

investigate the factors described above. The following

specific deficiencies, due to the open-ended questions, were

noted by the researcher:

1.   The number of different answers to some questions

was large. For one question, there were 152 replies that

were finally coded into 35 different categories. This gave

a good indication of the variety of factors influencing a

respondent's answer but created some difficulty when the

researcher tried to reduce the number of categories to a

workable amount. A list of categories developed for the

open-ended questions is at Appendix D.

2.   The variety of answers to individual questions

ranged from very general to very specific. Hidden in the

general reply may be a more specific reason. The open-ended

questions did not constrain the way in which a respondent

answered so specifics may remain hidden in the more general

answers.

3.   Those questions that contained wording such as

"the most difficult" gave no indication of the degree of

difficulty encountered by the respondent. Therefore the

reply of one respondent who found a sequence of training

relatively easy but truthfully described it as most

difficult would register the same answer as a respondent who

had great difficulty with the same sequence and described it also as the most difficult.

4. The answer categories developed for the open-ended questions did not even meet the requirements for an nominal scale (16:46). The categories were not necessarily mutually exclusive, for the reasons stated above. Therefore, only questions 2, 3, 4, 5, 9, 10, 11, 13, and 17 were analysed statistically.

Effectiveness of Given Survey in Investigating the Defined Factors

The given survey did not investigate the defined areas of learning, motivation and evaluation to any great depth for the reasons given on the previous pages. On the other hand, a large amount of data, useful to the researcher in developing an improved survey instrument, was contained in the given survey.

Data Analysis of Given Survey

Four SPSSx procedures were used to analyse data collected from the given survey. The results of these analyses are described in the following paragraphs:

FREQUENCIES Procedure. The outcomes of the frequencies procedure are described by the question number with variable name included:

1. Question 1.a. Pre Solo Stage. During the pre-solo stage, respondents indicated they encountered difficulty with the following sequences:

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a. 71% - circuits or a particular part of circuit flying.

b. 8% - no difficulty.

c. Each remaining category contained less than 4% of replies.

Note: The category "Other", for this and the next six variables, is a grouping of categories containing three or less replies.

2. Question 1.b. General Flying. During the post-solo general flying (GF) stage, respondents indicated they encountered difficulty with the following sequences:

a. 18% - circuits.

b. 18% - practice forced landings (PFLs).

c. 18% - slow rolls.

d. 11% - no difficulty.

e. 8% - aerobatics in general.

f. Each remaining category contained less than 4% of replies.

3. Question 1.c. Instrument Flying. During the instrument flying (IF) stage, respondents indicated they encountered difficulty with the following sequences:

a. 18% - instrument scan technique.

b. 16% - limited panel flying.

c. 9% - instrument approaches.

d. 9% - no difficulty.

e. 7% - tacan approaches.

f. 7% - ground controlled approaches (GCAs).

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g.   Each remaining category contained less than 5% of replies.

4.   Question 1.d. Navigation. During the navigation stage, respondents indicated they encountered difficulty with the following sequences:

    a.   21% - no difficulty.

    b.   15% - map reading.

    c.   13% - low level navigation.

    d.   9% - navigation work cycle.

    e.   7% - high-low navigation.

    f.   Each remaining category contained less than 5% of responses.

5.   Question 1.e. Night Flying. During the night flying stage, respondents indicated they encountered difficulty with the following sequences:

    a.   31% - no difficulty.

    b.   17% - landing.

    c.   11% - circuits generally.

    d.   6% - application of IF/GF technique.

    e.   Each remaining category contained less than 5% of responses.

6.   Question 1.f. Formation Flying. During the formation stage, respondents indicated they encountered difficulty with the following sequences:

    a.   20% - level and turning rejoins.

    b.   10% - station keeping.

    c.   9% - leadership.

d.   6% - long line astern.

e.   Each remaining category contained less than
5% of responses.

7.   Question 1.g. Advanced Handling Stage. During the
advanced handling stage, respondents indicated they
encountered difficulty with the following sequences:

a.   15% - aerobatics.

b.   9% - no difficulty.

c.   7% - accurate flying.

d.   Each of the remaining categories contained 5%
or less of responses.

The results gained from questions 1.a to 1.g were
generally as expected. In the pre-solo stage, students are
trained to the stage where they can safely fly a circuit and
are then sent solo. Therefore it comes as no surprise that
71% of students said they found some aspect of circuit
flying as the most difficult in the pre-solo stage.
Students typically seem not to have much difficulty with
Navigation or Night Flying. Hence, it is understandable if
21% and 31% of students stated they had no difficulty with
Navigation and Night Flying respectively.

8.   Question 2. Overload. Questions regarding
overload were not specifically included in the survey. The
researcher has assumed that overload, to the student, could
mean having more work to complete than there seems time in
which to complete it. 42% of students indicated they
experienced that type of overload once or twice a week. 40%

indicated they experienced that type of overload less than once a week. No student replied that he experienced such an overload every day. A possible reason for this is that all respondents had either completed Phase 2 or Phase 5 and no student experiencing overload everyday could be expected to still be in the course.

9. Question 3. Extent of Overload. 79% of students indicated that overload impaired their preparation, for ground school or flights, from a slight to a moderate degree.

10. Question 4. Spread of Load. 63% of students indicated they spread their work load in favour of flying training, whereas 2% indicated they spread their work load in favour of ground school. One possible explanation of this response is that students know that every flight is assessed and would therefore be likely to put their efforts into preparation for flying training in lieu of ground school when they were pressed for time.

11. Question 5. Depth of Learning Required. 65% of students indicated that they were not required to learn any aspect or material at too great a depth, while 32% indicated that they were required to do so.

12. Question 5. Depth of Ground Training. Of the 32% of students that indicated they were required to learn material at too great a depth, most complained about the following subjects:

    a.   Meteorology.

b.   Aircraft Systems.

c.   Aerodynamics.

13.   Question 5. Depth of Flying Training. 97% of
students indicated that they were not required to learn any
aspect of flying instruction at too great a depth. Students
are in the course to learn to fly. They may complain about
ground school subjects that seem to be interfering with
their flying training, but it is unlikely that a student
would complain about the depth of early flying training
because at this stage of their training there is always
something for them to learn as a pilot.

14.   Question 6. Difficulties with Ground School
Instruction. Students indicated that they had difficulty
with the following aspects of ground instruction:

a.   39% - no difficulty

b.   19% - poor instructional technique

c.   10% - too much material

d.   10% - meteorology

e.   7% - aircraft systems

f.   Each remaining category contained 5% of
     replies or less.

15.   Question 6. Difficulties with Flying Instruction.
Students indicated that they had difficulty with the
following aspects of flying instruction:

a.   49% - no difficulty

b.   11% - QFI standardization

c.   7% - applying tecniques

   d. Each remaining category contained 5% of

     replies or less.

 16. Question 7. Difficult or Demanding Aspects of the

Course. Students were asked if they would indicate what had

been the most difficult or demanding part of the course.

This is a double question; difficult is not necessarily the

same as demanding. Students replied in the following way:

   a. 27% - instrument flying

   b. 6% - Phase 5 instrument flying

   c. 5% - conflict between ground school and

     flying training requirements

   d. 5% - Phase 4 instrument flying

   e. 5% - no difficulty

   f. Each of the remaining 29 categories contained

     less than 4% of replies.

 17. Question 8. The Most Stressful Part of the

Course. Students indicated the most stressful part of the

course was as follows:

   a. 11% - tests

   b. 10% - instrument flying

   c. 7% - no diffculty

   d. 6% - Phase 5

   e. 5% - retests

   f. 5% - Basic Handling Test

   g. Each of the remaining 26 categories contained

     less than 5% of replies.

18. __Question 9. Effectiveness and Importance of Instructional Aspects of the Course__. Students generally rated the effectiveness of the variables at this question as 2 (effective) and the importance of the variables as 3 (very important).

19. __Question 10. How QFIs are Perceived__. 93% of students indicated that they perceived the QFIs as being there to help them pass the course.

20. __Question 11. Number of QFIs at 1FTS and 2FTS__. 60% of students replied that they had trained under five or fewer QFIs at 1FTS and 50% replied that they had trained under five or fewer QFIs at 2FTS. Replies ranged up to 20 for both flying schools.

21. __Question 12. Difficulties Relating to QFIs__. 63% of students indicated that they had no difficulty in relating with their flying instructors. Other replies were:

        a.   7% - communication was difficult

        b.   5% - QFIs were difficult to approach

        c.   Each of the remaining categories contained less than 4% of replies.

22. __Question 13. Gliding Experience__. 83% of students indicated that they had zero gliding hours prior to entering 1FTS. Other replies ranged from five to 75 gliding hours.

23. __Question 13. Powered Flying Experience__. 49% of students indicated that they had zero powered flying hours prior to entering 1FTS. Other replies ranged from two to 1700 powered flying hours.

24. Question 14. Influence to Apply for Pilot Training. Students indicated that the main influence on their decision to apply for pilot training was as follows:

      a.   36% - a desire to fly military aircraft

      b.   20% - an ambition since an early age

      c.   15% - professional advancement

      d.   Each other category contained 5% or less of replies.

25. Question 15. Reason for Becoming a RAAF Pilot. Students indicated, that at this stage of their training, they wanted to become a pilot in the RAAF for the following reasons:

      a.   34% - a desire to fly military aircraft

      b.   16% - the RAAF is a satisfying career

      c.   16% - the RAAF is a challenging career

      d.   9% - the RAAF is a professional career

      e.   Each other category contained 6% or less of replies.

26. Question 16. Primary Role in the RAAF. Students indicated that their primary role as a pilot in the RAAF would be:

      a.   25% - to fly military aircraft

      b.   19% - the defence of Australia

      c.   13% - to maintain a high standard

      d.   13% - a pilot and an executive

      e.   12% - no answer

      f.   11% - to fly plus carry out other duties

27. Question 17. Satisfaction With Career Choice. 93%
of students indicated that they were extremely satisfied or
very satisfied with their choice of a career.

28. Question 17. Source of Satifaction. Students
indicated that their source of satisfaction/dissatisfaction
was:

a. 38% - a sense of achievement

b. 18% - the enjoyment of flying

c. 13% - a rewarding career

d. 8% - no answer

e. 7% - like the life style

f. 6% - personal challenge

g. 6% - dissatisfied with the RAAF system

PEARSON CORR Procedure. A correlation table was
constructed for all variables. Because of the nature of the
scales developed for the open-ended questions, the
correlations involving the open-ended questions were
disregarded. A level of significance of 95% was used when
analysing the correlation table.

1. Overload versus Extent of Overload

$r = -.2561, \quad p = .001$

Here students indicating that they experienced
overload less often per week also indicated that when they
did experience overload, it caused more of an impairment to
preparation.

2. Overload versus Spread of Load

$r = -.3729, \quad p = .000$

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Here students indicating that they experienced overload less often per week also indicated that they tended to spread the load so that the requirements of flying training received more of their attention. Looking at the frequency tables, 93% of students responded that they experienced overload twice a week or less and 63% of students responded that they spread the load in favour of the requirements of flying training, which explains the size of the negative correlation.

3.   Course Number versus Effectiveness of Mass Briefings

$r = .2565, \quad p = .001$

Here students from the later courses tended to rate the effectiveness of mass briefings higher than did students from earlier courses. The standard of mass briefings may have improved after the critiques of earlier courses due to greater efforts by QFIs or the overall experience level of the QFIs may have increased, resulting in better briefings. The students on the later courses may have been less critical of the effectiveness of mass briefings.

4.   Course Number versus Effectiveness of Inflight Remediation

$r = .2800, \quad p = .000$

Here students from the later courses tended to rate the effectiveness of inflight remediation higher than students from earlier courses. The standard of remediation

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given by QFIs in flight may have improved after the
critiques of earlier courses due to greater efforts by QFIs
or the overall experience level of the QFIs may have
increased, resulting in better inflight remediation. The
students on the later courses may have been less critical of
the effectiveness of inflight remediation.

5.   Phase Completed versus Number of QFIs at 1FTS

$r = -.3293, \quad p = .000$

Here the students responding at the end of Phase 5
indicated that they had had fewer assigned QFIs than those
students responding at the end of Phase 2. This may be due
to the fact that the students at the end of Phase 2 were
still at 1FTS and recalled all the instructors they flew
with, whereas the students responding at the end of Phase 5
recalled only their permanently assigned instructors (a
student normally has only one permanent instructor per
flying Phase).

6.   Number of QFIs at 1FTS versus Course Number

$r = .3187, \quad p = .000$

Students from the later courses indicated that
they had had a greater number of QFIs at 1FTS. Perhaps a
higher turnover of QFIs at 1FTS, when the students from the
later courses were at 1FTS, caused an increase in the number
of QFI changes. This is possible because in the last two
years there has been a higher than normal pilot resignation
rate in the RAAF.

7.   Extent of Overload versus Spread of Load

$r = .3380, \quad p = .000$.

Students indicating an increased amount of impairment due to overload also indicated spreading the load in favour of the requirements of flying training. This is entirely understandable because a student faced with a large amount of work would be very likely to ensure that he prepared properly for the next flight and then devote his remaining time to ground school study.

8.   Number of QFIs at 1FTS versus Number of QFIs at 2FTS

$r = .3047, \quad p = .001$

Students indicating a higher number of instructors at 1FTS also indicated a higher number of instructors at 2FTS. Question 11 is worded such that it does not indicate whether the respondent should list the number of permanently assigned instructors or all instructors with whom flown (for example; permanently assigned instructors, testing officers and stand-in instructors). Respondents probably adopted one approach or the other to answer both parts of Question 11.

There were a number of correlations in the correlation table greater than .25 involving the effectiveness and importance variables at Question 9. Because of this, the interaction of these variables was investigated using the CROSSTABS procedure.

CROSSTABS Procedure. Because of the indicated correlations between the effectiveness and importance of the

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variables in Question 9. of the given survey, a CROSSTABS
analysis of these variables was conducted. The results of
this procedure indicated that there was a significant
($p < .05$) relationship (difference) between the pairs of
variables in Table II. The following abbreviations were
used in Tables II and III:

EFF   Effectiveness

IMP   Importance

MB   Mass Briefing

PFB   Pre flight briefing

IFD   Inflight demonstration

IFE   Inflight evaluation

IFR   Inflight remediation

DEB   De-brief

ISR   Instructor/student relationship

AID   Preparation and use of teaching aids

SP   Student preparation

Example: MBEFF = Effectiveness of mass briefings

Table II.

Significant Differences Between Variables

Variables	Chi-Square	p - value	Cramer's V
MBEFF by MBIMP	31.53	.000	.26
MBEFF by AIDIMP	20.52	.015	.21
PFBEFF by PFBIMP	25.81	.000	.29
IFDEFF by PFBIMP	10.29	.036	.19
IFDEFF by IFDIMP	18.00	.000	.35
IFEEFF by IFEIMP	31.25	.000	.33
IFREFF by IFRIMP	29.17	.000	.31
DEBEFF by ISRIMP	17.33	.008	.24
ISREFF by ISRIMP	22.66	.001	.27
ISREFF by AIDIMP	24.40	.004	.23
AIDEFF by PFBIMP	19.49	.003	.26
AIDEFF by AIDIMP	47.51	.000	.33
SPFEFF by ISRIMP	16.19	.003	.23

The Cramer's V statistic indicated that the strongest relationship (largest difference), existed among the above pairs of variables where the effectiveness and the importance of the same area were paired. Table III shows those effectiveness variables that students consistently rated lower than the corresponding importance variable.

Students rated the effectiveness of mass briefs, preflight briefings, inflight demonstration, inflight evaluation, inflight remediation, instructor/student relationship and teaching aid preparation lower than they rated the importance of these areas.

Table III.

Effectiveness Versus Importance

MBEFF   less than   MBIMP

PFBEFF   less than   PFBIMP

IFDEFF   less than   IFDIMP

IFEEFF   less than   IFEIMP

IFREFF   less than   IFRIMP

ISREFF   less than   ISRIMP

AIDEFF   less than   AIDIMP

T-TEST Procedure. Students in course 137 were surveyed twice and the researcher investigated, using the T-TEST procedure, if there was a difference between the responses to Question 9 at the end of Phase 2 compared to the responses at the end of Phase 5 for these course 137 students. The results of the T-TEST, for course 137, indicated that there was a significant (p < .05) difference between the responses at the end of Phase 2 and the responses at the end of Phase 5 for the following variables:

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MBEFF - Effectiveness of mass briefing

IFDEFF - Effectiveness of inflight demonstration

IFREFF - Effectiveness of inflight remediation

CAREFF - Effectiveness of caring for frame of mind

AIDEFF - Effectiveness of teaching aids

There was not a significant difference for any of the other effectiveness variables or for any of the importance variables. The course 137 students, at the end of Phase 5, rated the effectiveness of mass briefings, inflight demonstration, inflight remediation, caring for frame of mind and preparation and use of teaching aids lower than the course 137 students at the end of Phase 2. This difference could be the result of a number of factors. First, the staff at 2FTS may not have been as effective in these areas as the staff at 1FTS. Second, the students at the end of Phase 5 were more experienced than when they were at the end of Phase 2. This could mean that the students at 2FTS were more critical of the course as presented and also better able to assess the effectiveness of the given instruction. Third, the students at the end of Phase 5 had just successfully completed the course and may have attributed their success to their own ability more than to the effectiveness of the instruction.

Next, the effectiveness variables and the importance variables from Question 9 were summed respectively to investigate any differences between overall effectiveness

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and overall importance from course to course. The variable

created by this summation of effectiveness was labeled

SUMEFF. There were statistically significant ($p < .05$)

differences between the surveyed courses in the areas shown

in Table IV. Phase is abbreviated to (Ph) in Table IV.

Table IV.

Overall Effectiveness Comparisons

Courses	Variable	T value
133 Ph 5 compared to 138 Ph 2	SUMEFF	-8.40
134 Ph 5 compared tp 138 Ph 2	SUMEFF	-5.97
135 Ph 5 compared to 138 Ph 2	SUMEFF	-4.29
136 Ph 5 compared to 138 Ph 2	SUMEFF	-4.77
137 Ph 5 compared to 138 Ph 2	SUMEFF	-8.11
133 Ph 5 compared to 137 Ph 2	SUMEFF	-2.79
133 Ph 5 compared to 137 Ph 5	SUMEFF	2.35
138 Ph 2 compared to 137 Ph 2	SUMEFF	4.00

There was no significant difference between any of the

respondents in the way they rated overall importance of the

areas at Question 9. In six of the eight cases above,

students at the end of Phase 5 rated overall effectiveness

lower than the students surveyed at the end of Phase 2 as

was indicated above when the two sets of surveys for course

137 were analysed. In the remaining two cases, course 137

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rated overall effectiveness lower than course 138 (both at the end of Phase 2) and course 133 (both at the end of Phase 5). The researcher noted that course 137 (Phase 5) rated overall effectiveness lower than all other courses surveyed at the end of Phase 5, but significantly less than course 133. Similarly course 137 (Phase 2) rated overall effectiveness lower than course 138 (Phase 2). From the information available the researcher cannot explain why course 137 had this low opinion of overall effectiveness.

Description of New Survey Instrument

General. The new survey instrument should investigate the degree to which the three broad factors of learning, motivation and evaluation affect the performance of student pilots. Content areas that should be investigated include the factors of learning, motivation and evaluation as further defined at the end of Chapter II.

The given survey contained two features that the researcher considered appropriate for incorporation in a new survey. These were:

1.   The investigation of the effectiveness and importance of various areas of instruction in the pilots course.

2.   The investigation of the amount of difficulty experienced by students in various areas of flight training.

Additionally a new survey should include questions to gather demographic data on respondents.

New Survey Outline. The outline of a new survey is at Appendix E along with a sample cover letter developed from the cover letter to the given survey. To investigate the degree to which learning, motivation and evaluation influence the performance of student pilots, the researcher used a series of statements combined with a six point rating scale ranging from "strongly agree" to "strongly disagree". The statements were constructed using, where possible, appropriate open-ended questions from the given survey and student replies to these open-ended questions.

To investigate the effectiveness and importance of various areas of instruction, the researcher proposed an increase in the number of areas in the survey and expansion of the effectiveness and importance scales to five point scales.

To more effectively investigate the amount of difficulty experienced by students in various areas of flight training, the researcher used the categories developed for Questions 1.a to 1.g from the existing survey to greatly expand the areas investigated. The areas of investigation were split into two sections, 1FTS instructional sequences and 2FTS instructional sequences. A five point measurement (difficulty) scale was also developed. The increased number of areas surveyed and the use of a measurement (difficulty) scale should permit future researchers to conduct more powerful statistical analyses of the data collected by this series of questions.

Finally, the researcher has included a series of questions in the outlined new survey to gather demographic data on the respondents.

Continued Development of New Survey Outline. The following suggestions are made with regard to the outlined new survey so as to maximize its usefulness to the RAAF:

1.   Development of the survey, collection of data, analysis of the data and follow up based on this data analysis should be officially sponsored and actively supported by the RAAF.

2.   The RAAF Psychologists should administer the survey to ensure the confidentiality of the respondents while retaining the ability to correlate student performance in ground school tests, student performance in flying, individual psychological profiles, and aptitude test scores with student replies to the survey instrument.

3.   The responses of students who fail are probably more valuable than the responses of those students who pass the course. A fully developed survey instrument could be made a part of the reporting system for those student pilots suspended from training.

V. Conclusions and Recommendations

The survey that was given was an important first step
in attempting to identify any problem areas in the RAAF
pilots course that could benefit from improvement. The next
step to reduce the failure rate among RAAF student pilots
should be an expansion of the investigation to gain more
useful information in a form that can be statistically
analyzed.

Conclusions

The researcher has concluded that a student's
performance on a course of flight training is significantly
influenced by learning, motivation and evaluation factors.
When these factors were expanded and applied to pilot
training, the factors which significantly influenced the
performance of student pilots were:

    1.   Learning, subdivided into

        a.   the standard of instruction,

        b.   the methods of instruction,

        c.   the learning practices employed by students,
and

        d.   the amount of instruction given to students
in how to learn and study.

    2.   Motivation, subdivided into

        a.   the level of student motivation,

b.   the level of student/instructor relationships,

c.   student understanding of training objectives, and

d.   the standard of physical working and living conditions.

3.   Evaluation, subdivided into

a.   feedback to students of ground school and flight results, and

b.   the conflict between preparation for ground school tests and preparation for flights.

In the researcher's view, the existing survey instrument did not adequately probe the ten areas described above to sufficient depth. One reason for this was the style of question that was used. The open-ended nature of many of the questions meant that the above ten areas were not adequately addressed and the respondents could not indicate degree of agreement, disagreement or difficulty when answering questions.

The following general and specific conclusions are based on the analysis of the data gathered via the existing survey instrument:

1.   The survey was administered only to those students still making satisfactory progress. 101 respondents had completed the course and 51 had completed training at 1FTS (Phase 2). The most recent failure rate is 36 percent. Therefore, for the 101 respondents who completed the course,

there were approximately 60 students who failed to meet the required standard. The opinions of these students were not surveyed. In the researcher's view, the opinions of those students who fell by the wayside are even more important than the opinions of the students who made the grade. It is possible that the problems encountered by the students who failed flight training affected their performance so significantly that they were suspended.

2.   The existing survey did not collect any demographic data. Demographic data would allow a researcher to test if, for example, students of a certain age or with a certain level of education had better or worse prospects of passing the RAAF pilots course.

3.   Some form of performance data should be collected on the respondents. The performance data would allow a researcher to relate student perceptions of the pilots course to actual student performance in the course and make it possible to test for any relationships.

4.   The use of some individual numerical code (perhaps RAAF service number) to identify a student's responses (not the student) should be adopted. This would permit a researcher to statistically compare the responses of an individual student surveyed twice during the course and assess the effects of the intervening training (the treatment) on the student's views.

5.   Students rated the effectiveness of some areas of instruction lower than the importance of these same areas.

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The researcher concluded that this was a result of either a poor understanding of the training objectives on the part of the students or the instruction in these areas was not as effective as it could have been.

6.   Students at the end of Phase 5 rated the effectiveness of some areas of instruction in the pilots course lower than did students at the end of Phase 2. The researcher concluded that this was a result of students becoming more proficient pilots and more critical of instruction as the course progressed.

7.   Many students indicated that they experienced overload to some extent each week during the early parts of the pilots course. The researcher understands that a large amount of material is presented to students on a pilots course in the early weeks. It is concluded that students indicated they experienced overload due to one or more of the following factors:

    a.   Less than effective instruction on how to learn and how to study.

    b.   A large amount of material.

    c.   Students not used to intensive study

The replies to the existing survey provided a very important basis for the construction of a new survey outline. The researcher also retained, from the existing survey, the concept for investigating how difficult various parts of the pilots course were to students and the concept of comparing the importance and effectiveness of various

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aspects of instruction. The new survey outline was constructed in a manner to adequately investigate each of the expanded areas of learning, motivation and evaluation.

Recommendations

The researcher makes the following recommendations:

1. The new survey outline should be further developed into a proper survey instrument.

2. Student pilots in the RAAF should be surveyed using the improved survey instrument.

3. Student pilots should be surveyed twice during training to gauge the effects of the training.

4. The Director of Psychology - RAAF should control the surveys so that individual students can be identified by code number while maintaining respondent anonymity.

5. Student performance should be related to student replies to the survey to test for any link between student perception of the various aspects of the course and their performance on the course.

6. The responses of students suspended from training should be pursued with the utmost vigour. A completed survey should become a required annex to the RAAF Suspension Report for the pilot training course.

Appendix A: Map of Australia
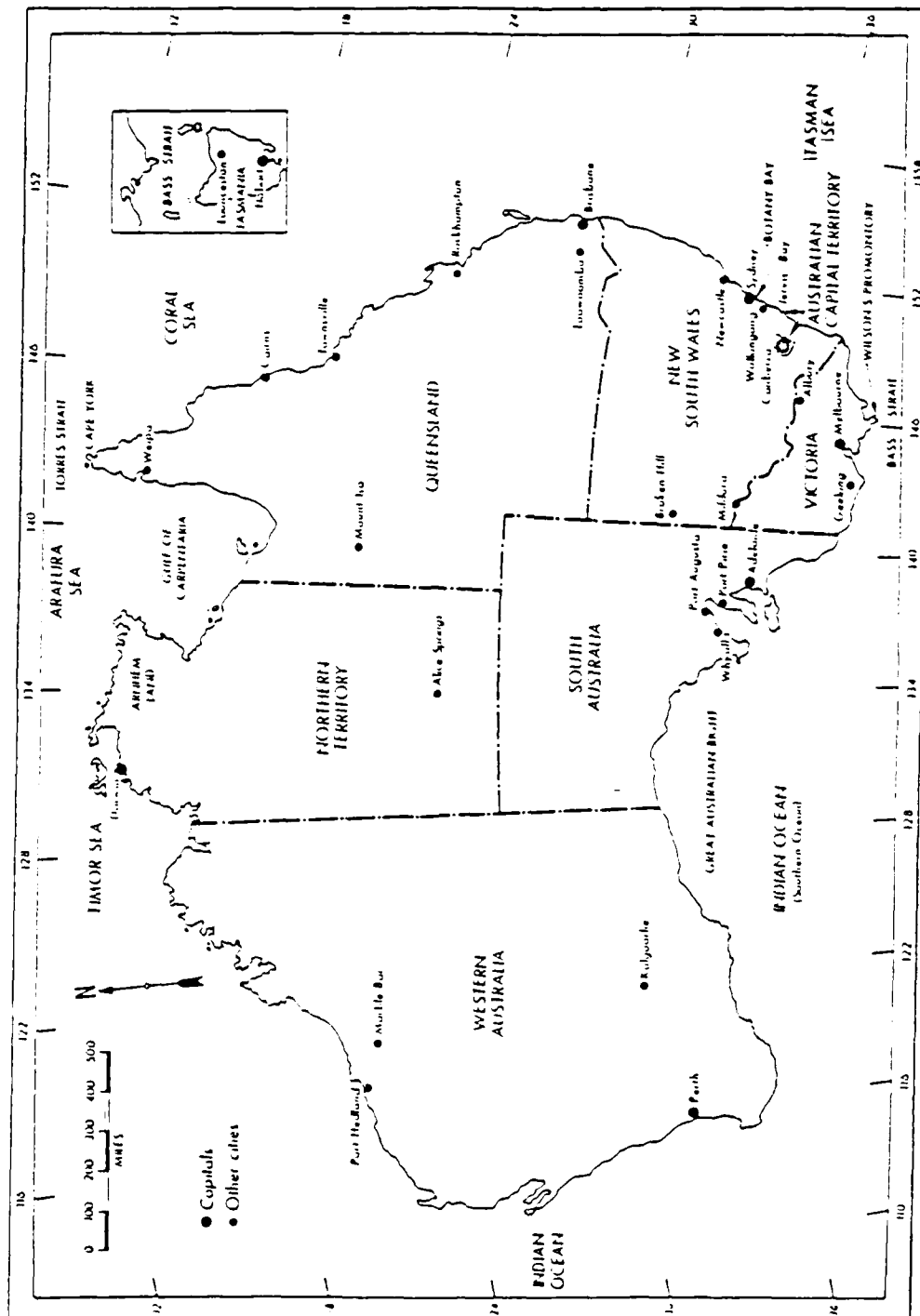
(12)

Appendix B: <u>Cover Letter to Given Survey</u>

DEPARTMENT OF DEFENCE
AIR FORCE OFFICE

RUSSELL OFFICES
CANBERRA, A.C.T. 2600

IN REPLY QUOTE:

9 August 1985

To Participants

1.   We want to reduce the high suspension rate
associated with flying training. If we can identify
'problem areas' more precisely, we may be able to bring
about an improvement.

2.   It is hoped that the responses to this questionnaire
will assist in the task of so identifying and prioritising
targets for intervention.   With this objective in mind,
would you please give time to think carefully about each
question before responding.

3.   Do not write your name on the questionnaire for
we want the survey to be conducted under conditions of
anonymity. No attempt will be made to identify any respondent
and full feed-backs of results will be sent to each Flying
Training School.

G. DYKE
Air Commodore
for Chief of the Air Staff
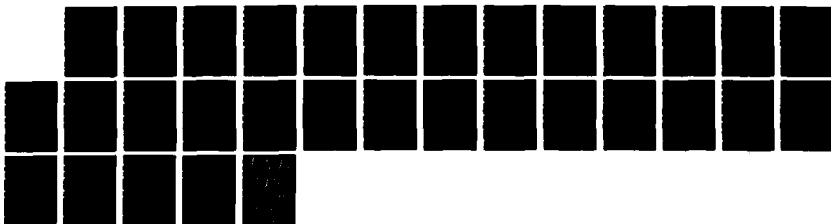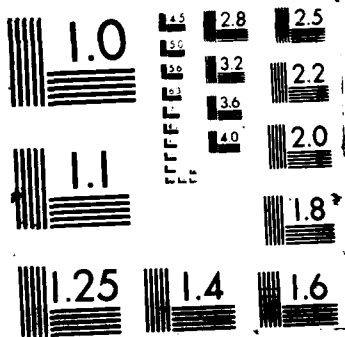
Appendix C: Sample of Given Survey

SURVEY OF RAAF STUDENT PILOTS

1. In your experience, what have you found to be
    the most difficult manoeuvre or sequence to
    learn in each of the following stages?

    a. In the pre-solo stage:
    Circuit work - only from
    base turn first to touchdown

    b. In the post-solo G.F. stage:
    Combining emergency procedures
    with G.F.

    c. In the instrument-flying stage:
    An understanding of NDB approch,
    and ADF.

    d. In the navigation stage:
    Most enjoyable

    e. In the night-flying stage:
    Judgement of correct flare
    heights

    f. In the formation-flying stage (2FTS only)
    _____
    _____

    g. In the advanced handling stage (2FTS only)
    _____
    _____

2. How often (if at all) have you experienced
    overload as a result of competing demands from
    flying training requirements and the
    requirements of ground-school instruction?

    Up to the finish of ground-school
    instruction, overload was exper-   ____
    ienced every day.

    Up to the finish of ground-school   ✓
    instruction, three or four times a
    week.

    Up to the finish of ground-school
    instruction, once or twice a week.   ____

    Up to the finish of ground-school
    instruction, less than once a week.   ____

    Overload as a result of competing
    demands was not experienced at all.   ____

3. If you reported experiencing any overload
    resulting from competing demands, please
    indicate the extent of the overload as this
    impaired preparation.

    Caused a major impairment as
    regards preparation.   ✓

    Caused a moderate impairment
    as regards preparation.   ____

    Caused a slight impairment as
    regards preparation.   ____

    Did not cause any impairment
    as regards preparation.   ____

4. If you reported experiencing any overload
    resulting from competing demands, please
    indicate whether you spread the load:

    In favour of the requirements of
    flying training.   ____

    About equally between the require-
    ments of flying training and the   ✓
    requirements from ground-school
    instruction.

    In favour of the requirements of
    ground-school instruction.   ____

5. Do you consider that students are required to
    learn any aspect or material at too great a
    depth?

                                  Yes   ✓

                                  No   ____

                                  Uncertain ____

    If you responded either 'Yes' or 'Uncertain',
    would you please identify this material or
    aspect of instruction.

    Ground Training _Meteorology general (at IFTS)_
    to certain extent information for pilots
    theories lies with the intricate details, public
    ie the airflows
    Flying Instruction _____
    _____
    _____

6. What difficulties, if any, have you experienced in understanding:

   a. Ground-school instruction Meteorology
   _____
   _____
   _____

   b. Flying instruction _____
   _____
   _____
   _____

   Any ideas about what might help? A more
   original *syllabus* relevant to
   pilots.
   _____

7. In your experience, what has been the **most** difficult or demanding part of the course so far?

   Mental preparation of a
   flight
   _____

   Any ideas about what might help? Perhaps
   psychological instruction on
   how to prepare mentally
   for a flight
   _____

8. In your experience, what has been the **most** stressful part of the course so far?

   Demands placed on students to
   perform *flying training.*
   _____

   What might be done to remove, or, if this is not possible, alleviate that stress?

   1 To dispell the students
   preconceived idea that at
   IFTS they are trying
   to *chuck you out*

   2. Most stress occurs
   when a student realises
   he is struggling with
   a *sequence* near to
   the point of suspension.
   Some flexibility with
   hours could be introduced
   to (a) allow the student to
   come up to scratch
   (a) relieve the fear of
   suspension *flying with*
   extra manuals

9. In your view, at how effective a level are each of the following aspects of flying instruction being undertaken?

   0 = Not Effective   1 = Somewhat Effective
   2 = Effective   3 = Very Effective

   After rating 'effectiveness', please rate the importance of each aspect of flight instruction
   using the following scale.

   0 = Not Important   1.= Somewhat Important
   2 = Important   3 = Very important

	How Important	How Effective
Mass Briefing	2	1
Pre-Flight Briefing	2	2
In-flight Demonstration	3	3
In-flight Evaluation	2	3
In-flight Remediation	2	2
Caring for frame of mind / anxiety / demoralization	3	2
De-Brief	2	2
Instructor-student relationship / rapport	2	2
Preparation and use of teaching aids		
Student preparation	2	1
Other (please specify)		
_____		

   In what way or ways could these aspects of flying instruction be improved?

   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____

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10. Do you perceive the flying instructor as being there to help you pass the course?

Yes ✓

No ____

Uncertain ____

If you responded with either 'No' or 'Uncertain', what do you think the reason for your perception might be?

_____
_____
_____

11. To this stage of your course, how many RAAF Flying Instructors have you trained under?

a. At 1 FTS ___7___

b. At 2 FTS _____

Any comment about this? _The number is_
mainly to do with instructors
being on leave or sick.

12. What difficulties, if any, have you encountered in relating with your flying instructor(s)?

____NONE_____
_____
_____
_____

Any ideas about what might help? _____
_____
_____
_____

13. So that we may better appreciate your answers to the questions asked in this survey, would you please tell us:

a. Your hours of gliding experience (if any) prior to entering 1FTS.   O

b. Your hours of powered flying (if any) prior to entering 1 FTS.   C

14. What was the main influence in your decision to apply for pilot training?

Wanted to join the Defence
Force as well as
fly aircraft.

15. At this stage of training, why do you want to become a pilot in the Royal Australian Air Force?

_____
_____
_____
_____
_____

DID

16. What do you perceive will be your primary role as a pilot in the Royal Australian Air Force?

Defence of Australia
_____
_____
_____
_____

17. At this stage, how satisfied are you with your choice of a career?

a. Extremely Satisfied   ✓

b. Very Satisfied   ____

c. Satisfied   ____

d. Dissatisfied   ____

e. Very Dissatisfied   ____

f. Extremely Dissatisfied   ____

Would you please tell us the source(s) of your satisfaction or dissatisfaction? _The_
comradeship between course members
is very satisfying as well as the
overall life / lifestyle
associated with the RAAF.
_____
_____

18. This survey is aimed at gathering data about problems in flying instruction and possible solutions. In the space below you are invited to provide any other information which you feel is relevant.

From my experience in here
people seem to give up too
what I've heard even though
1FTS is special to be a
credential to people who have
never flown twin choose
that those people who had previous
flying would not feel over all
the flying environment than those
with no flying experience
perhaps a ten can help itself
be devoted to ....
_____

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19. Although every care is being taken to ensure that all respondents remain anonymous, it is necessary to know the stage of training reached. For this purpose, would you please record the number of your course and the stage of training reached?

Course No.   136

Stage of training reached   BHT

THANK YOU FOR YOUR TIME AND EFFORT

Appendix D: Categories Developed for Open-Ended Questions

	Question 1.a.	Question 1.b.	Question 1.c.
1	Circuits	Circuits	Scan techniques
2	Base turn	PFLs	Limited panel
3	Landing	Slow rolls	Tacan
4	Check lists	Aerobatics	Intercept/tracking
5	Stalling	Spinning	Orientation
6	Emergencies	Emergencies	Emergencies
7	Attitude flying	Accuracy	Sector entry
8	Organization	Organization	Organization
9	Other	Other	Other
10	No difficulty	No difficulty	No difficulty
11			Missed approach
12			Circling approach
13			GCA
14			Steep turns
15			Finals
16			Accuracy
17			IF approach

	Question 1.d.	Question 1.e.	Question1.f.
1	Nav work cycle	Circuits	Leadership
2	High- low nav	Landing	Station keeping
3	R/T procedures	IF/GF technique	Rejoins
4	Low nav	Night diversion	Turning rejoins
5	Map reading	Base turn	Smooth control
6	Mental DR	Finals	Long line astern
7	RTB	New airfield	Belly turns
8	Organization	Flapless circt.	Formation IF
9	Other	Other	Other
10	No difficulty	No difficulty	No difficulty
11	High nav	Cockpit lights	
12		Aspect of R/W	
13		Accuracy	

	Question 1.g.	Question 5. GTS	Question 5. FTS
1	Circuits	No material	None
2	Non std. emerg.	Meteorology	Aerobatics
3	Non std. PFLs	Aerodynamics	Planning ahead
4	Man. on buffet	A/c systems	Want more depth
5	Aeros sequence	Navigation	
6	Aerobatics	Weapons	
7	Accuracy	Avionics	
8	Captaincy	Flt. instruments	
9	Other	Too much material	
10	No difficulty	Other	
11	Max. rate turns		

	Question 6. GTS	Question 6. FTS	Question 7.
1	No problems	No problems	IF
2	Poor IT	QFI st'dization	Post solo
3	Too much info	Applying tech.	Pre BHT
4	A/c systems	Rate of learning	Tests
5	Meteorology	Poor QFI IT	GF
6	Aerodynamics	Understanding QFI	Morse & Met
7	Navigation	Debriefs	BHT
8	Grasping concepts	Captaincy	GFPT
9	Poor programming	Understand Obj.	Aerobatics
10	Understand obj.	Continuity	Pre solo
11	Other	Procedures	Flying
12		IF	Apply tech.
13		Aerobatics	Varying workload
14		Other	Phase 4 IF
15			GTS & FTS conflict
16			Formation
17			Nav preparation
18			High flying rate
19			Develop confidence
20			Phase 5
21			Phase 3
22			Having a bad flt.
23			Time allocation
24			Dev. concentration
25			Conceited QFIs
26			Self motivation
27			Nil
28			Reach reqd. std.
29			Preparation
30			Being a student
31			Navigation
32			Length of course
33			Phase 5 IF
34			Procedures

	Question 8.	Question 12.
1	IF	No problems
2	Tests	Clash with QFI
3	Pre solo	QFI st'dization
4	GFPT	No understandign from QFI
5	Pre BHT	QFI difficult to approach
6	GTS & FTS Conf.	Communication difficulty
7	Pre GFPT	Tense QFI
8	BHT	Too much prompting from QFI
9	IPT	Rushed briefings
10	Weather	Difficult to relax with QFI
11	Nil	Immature QFI
12	Solo	QFI has firm views
13	Phase 3 GF	Understanding reqts. of QFI
14	High fly rate	Other
15	Phase 5 IF	
16	Nav preparation	
17	Negative f'back	
18	Navigation	
19	Formation	
20	Phase 4	
21	Poor performance	
22	GF	
23	Decision making	
24	Phase 5	
25	Flying	
26	Each flt. a test	
27	Failing a test	
28	FIHT	
29	Retests	
30	Being a student	
31	Conceited QFI	
32	Program changes	

	Question 14.	Question 15.
1	Ambition	Want to fly military a/c
2	Exciting career	Professional career
3	Want to fly military a/c	Challenging career
4	Satisfying & secure career	Satisfying career
5	Challenging career	To fulfil ambition
6	Professional advancement	No answer
7	No answer	Career progression
8	Other pilots	National defence
9	Family influence	To change jobs
10	Air Training Corps	Airline career
11	Airline career	RAN
12	National pride	

	Question 16.	Question 17.
1	Defence of Australia	Sense of achievement
2	Fly military a/c	Rewarding career
3	To fly plus other duties	Enjoy flying
4	Assigned duties	Like the lifestyle
5	No answer	No answer
6	RAN	Personal challenge
7	Pilot/executive	Increasing experience
8	Maintain a high standard	Join elite group
9		Dissatisfied with system
10		Own progress slow

AUSTRALIA

DEPARTMENT OF DEFENCE

AIR FORCE OFFICE

To Participants

We want to reduce the high suspension rate associated with pilot training in the Royal Australian Air Force. If we can identify 'problem areas' in the flying course, then practical solutions will be actively sought to bring about reductions in the suspension rate.

During the selection process for pilot training you demonstrated the potential to cope with the challenge of flying military aircraft. Your views are vital to our research so please carefully consider each item on the following pages before responding.

Do not write your name on any of the pages. Take as much of the time set aside as you need. Please direct any questions that you may have to the supervising staff member.

Thank you for your cooperation and time.

A. B. CEE
Air Commodore

Draft Outline of New Survey

Not Difficult	Slightly Difficult	Moderately Difficult	Very Difficult	Extremely Difficult
1	2	3	4	5

Please use the rating scale at the top of this page and following pages to describe **HOW DIFFICULT** it was **FOR YOU** to become reasonably proficient in the following areas:

Flying Sequences at 1FTS:

Circuits

1.   - overall   1 2 3 4 5

2.   - takeoff   1 2 3 4 5

3.   - crosswind turn   1 2 3 4 5

4.   - downwind leg   1 2 3 4 5

5.   - baseturn   1 2 3 4 5

6.   - finals   1 2 3 4 5

7.   - landing   1 2 3 4 5

Practice Forced Landings (PFLs)

8.   - overall   1 2 3 4 5

9.   - PFL pattern   1 2 3 4 5

10.   - emergency checks   1 2 3 4 5

11.   - field selection   1 2 3 4 5

12.   - wind assessment   1 2 3 4 5

Aerobatics

13.   - overall   1 2 3 4 5

14.   - slow rolls   1 2 3 4 5

15.   - barrel rolls   1 2 3 4 5

Draft Outline of New Survey

	Not Difficult	Slightly Difficult	Moderately Difficult	Very Difficult	Extremely Difficult
	1	2	3	4	5

1FTS (Continued)

16.	− wingovers	1 2 3 4 5
17.	− loops	1 2 3 4 5
18.	Spinning	1 2 3 4 5
19.	Stalling	1 2 3 4 5
20.	Attitude Flying	1 2 3 4 5
21.	Decision Making Inflight (Captaincy)	1 2 3 4 5
22.	Return to Base	1 2 3 4 5

Instrument Flying (IF)

23.	− overall	1 2 3 4 5
24.	− instrument scan technique	1 2 3 4 5
25.	− orientation using navigation aids	1 2 3 4 5
26.	− navigation aid intercepts and tracking	1 2 3 4 5
27.	− responding to emergencies while under the IF hood	1 2 3 4 5
28.	− sector entry/holding pattern	1 2 3 4 5
29.	− circling approach	1 2 3 4 5
30.	− missed approach	1 2 3 4 5
31.	− steep turns	1 2 3 4 5
32.	− maintaining accuracy while under IFR conditions	1 2 3 4 5

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Draft Outline of New Survey

	Not Difficult	Slightly Difficult	Moderately Difficult	Very Difficult	Extremely Difficult
	1	2	3	4	5

Navigation

33.	- overall	1 2 3 4 5
34.	- map reading	1 2 3 4 5
35.	- pinpointing aircraft position on map	1 2 3 4 5
36.	- performing navigation work cycle during flight	1 2 3 4 5
37.	- radio procedures during navigation exercises	1 2 3 4 5
38.	- mental dead reckoning (including 1:60 rule)	1 2 3 4 5
39.	- return to base	1 2 3 4 5
40.	- landing at unfamiliar airfield	1 2 3 4 5
41.	- map preparation	1 2 3 4 5
42.	- flight planning	1 2 3 4 5

Night Flying

43.	- overall	1 2 3 4 5
44.	- takeoff	1 2 3 4 5
45.	- general flying/instrument flying technique	1 2 3 4 5
46.	- base turn	1 2 3 4 5
47.	- finals	1 2 3 4 5
48.	- landing	1 2 3 4 5
49.	- judgement of runway aspect	1 2 3 4 5
50.	- circuits at other airfields	1 2 3 4 5

Draft Outline of New Survey

Not Difficult	Slightly Difficult	Moderately Difficult	Very Difficult	Extremely Difficult
1	2	3	4	5

Flying Sequences at 2FTS:

General Flying

51.	- Phase 3	1 2 3 4 5
52.	- Phase 4	1 2 3 4 5
53.	- Phase 5	1 2 3 4 5

Circuits

54.	- Phase 3	1 2 3 4 5
55.	- Phase 4	1 2 3 4 5
56.	- Phase 5	1 2 3 4 5

Aerobatics

57.	- basic	1 2 3 4 5
58.	- advanced	1 2 3 4 5
59.	- aerobatics sequence	1 2 3 4 5

Emergency Procedures

60.	- standard	1 2 3 4 5
61.	- non standard (Phase 5)	1 2 3 4 5

Instrument Flying

62.	- Phase 3	1 2 3 4 5
63.	- Phase 4	1 2 3 4 5
64.	- Phase 5	1 2 3 4 5
65.	- instrument scan technique	1 2 3 4 5
66.	- aid intercepts/tracking	1 2 3 4 5

Draft Outline of New Survey

Not Difficult	Slightly Difficult	Moderately Difficult	Very Difficult	Extremely Difficult
1	2	3	4	5

<u>2FTS</u>:

Instrument Flying (Continued)

67. - orientation with respect to navigation aids   1 2 3 4 5

68. - NDB approach   1 2 3 4 5

69. - Tacan approach   1 2 3 4 5

70. - GCA approach   1 2 3 4 5

71. - circling approach   1 2 3 4 5

72. - missed approach   1 2 3 4 5 .

73. - sector entry/holding pattern   1 2 3 4 5

74. - decision making during instrument flying   1 2 3 4 5

75. - steep turns   1 2 3 4 5

76. - precision finals technique   1 2 3 4 5

77. - emergencies   1 2 3 4 5

Navigation

78. - medium level   1 2 3 4 5

79. - high level   1 2 3 4 5

80. - low level   1 2 3 4 5

81. - high/low navigation   1 2 3 4 5

82. - navigation work cycle   1 2 3 4 5

83. - radio procedures   1 2 3 4 5

Draft Outline of New Survey

Not Difficult	Slightly Difficult	Moderately Difficult	Very Difficult	Extremely Difficult
1	2	3	4	5

2FTS:

Navigation (Continued)

84.	- mental dead reckoning (including 1:60 rule)	1 2 3 4 5
85.	- return to base	1 2 3 4 5
86.	- landing at new airfield	1 2 3 4 5
87.	- map preparation	1 2 3 4 5
88.	- map reading	1 2 3 4 5
89.	- pinpointing	1 2 3 4 5
90.	- flight planning	1 2 3 4 5
91.	- transition from high to low navigation	1 2 3 4 5
92.	- flying accurately and navigating	1 2 3 4 5

Formation

93.	- leadership	1 2 3 4 5
94.	- station keeping	1 2 3 4 5
95.	- station changing	1 2 3 4 5
96.	- level rejoins	1 2 3 4 5
97.	- turning rejoins	1 2 3 4 5
98.	- smooth control	1 2 3 4 5
99.	- relaxing	1 2 3 4 5
100.	- long line astern	1 2 3 4 5
101.	- belly turns	1 2 3 4 5

Draft Outline of New Survey

Not Difficult	Slightly Difficult	Moderately Difficult	Very Difficult	Extremely Difficult
1	2	3	4	5

2FTS: (Continued)

Practice Forced Landings

102.	- overall	1 2 3 4 5
103.	- non standard emergencies	1 2 3 4 5

Night Flying

104.	- overall	1 2 3 4 5
105.	- takeoff	1 2 3 4 5
106.	- general flying/instrument flying technique	1 2 3 4 5
107.	- base turn	1 2 3 4 5
108.	- finals	1 2 3 4 5
109.	- landing	1 2 3 4 5
110.	- judgement of runway aspect	1 2 3 4 5
111.	- diversion to other airfields	1 2 3 4 5

Draft Outline of New Survey

IMPORTANCE		EFFECTIVENESS
Not Important	1	Not Effective
Slightly Important	2	Slightly Effective
Moderately Important	3	Moderately Effective
Very Important	4	Very Effective
Extremely Important	5	Extremely Effective

Please use the above **IMPORTANCE** and **EFFECTIVENESS** scales to rate how important and how effective were the following areas of the pilots course:

	Importance	Effectiveness
112. Mass briefings.	1 2 3 4 5	1 2 3 4 5
113. Tutorials.	1 2 3 4 5	1 2 3 4 5
114. Pre-flight briefings.	1 2 3 4 5	1 2 3 4 5
115. Good QFI/student relations.	1 2 3 4 5	1 2 3 4 5
116. Student understanding of training objectives.	1 2 3 4 5	1 2 3 4 5
117. Student preparation.	1 2 3 4 5	1 2 3 4 5
118. QFI standardization.	1 2 3 4 5	1 2 3 4 5
119. In-flight demonstrations.	1 2 3 4 5	1 2 3 4 5
120. In-flight evaluation.	1 2 3 4 5	1 2 3 4 5
121. In-flight remediation	1 2 3 4 5	1 2 3 4 5
122. Debriefings.	1 2 3 4 5	1 2 3 4 5
123. Coordinated ground school and flying programs.	1 2 3 4 5	1 2 3 4 5
124. Caring attitude by QFIs toward students.	1 2 3 4 5	1 2 3 4 5
125. High standard of instruction from ground school staff.	1 2 3 4 5	1 2 3 4 5

Draft Outline of New Survey

Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6

Please use the rating scale at the top of this and following pages to indicate **YOUR AGREEMENT OR OTHERWISE** with the following statements:

126. The QFIs are there to help you pass
     the course.   1 2 3 4 5 6

127. The QFIs are easy to approach on flying
     matters.   1 2 3 4 5 6

128. The QFIs are easy to approach on
     personal matters.   1 2 3 4 5 6

129. The QFIs are willing to listen to a
     student's views.   1 2 3 4 5 6

130. QFI/student relations are very friendly.   1 2 3 4 5 6

131. QFIs take a pesonal interest in the
     wellbeing of the students.   1 2 3 4 5 6

132. It is easy to relax with the QFIs.   1 2 3 4 5 6

133. The QFIs are a mature group.   1 2 3 4 5 6

134. Standardization between QFIs is high.   1 2 3 4 5 6

135. The Standardization Officers' efforts
     to promote standardization among students
     are very apparent.   1 2 3 4 5 6

Draft Outline of New Survey

Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6

Please use the rating scale at the top of this page to indicate **YOUR AGREEMENT OR OTHERWISE** with the following statements:

136. Ground school exams are programmed so as not to interfer with the preparation for flights. 1 2 3 4 5 6

137. Students are given full feedback of results from ground school exams. 1 2 3 4 5 6

138. Students are given full feedback of assessments from each flight. 1 2 3 4 5 6

139. Students should be told the marks they are given for each flight. 1 2 3 4 5 6

140. Eventhough a student is doing poorly on course he still would benefit from knowing his marks for each flight. 1 2 3 4 5 6

141. During flight, QFIs offer praise when a student does something well. 1 2 3 4 5 6

142. During flight, QFIs offer criticism when a student does something poorly. 1 2 3 4 5 6

143. During debriefing after flight, QFIs mention only those areas where student performance was poor. 1 2 3 4 5 6

144. The competing demands of ground school and flight preparation have caused you to feel, at times, as though you were overloaded with work. 1 2 3 4 5 6

Draft Outline of New Survey

Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6

Please use the rating scale at the top of this page to indicate **YOUR AGREEMENT OR OTHERWISE** with the following statements:

145. A student's motivation to perform to the best of his ability, is greatly influenced by the level of rapport between a student and the QFI.   1 2 3 4 5 6

146. Compliments from the QFI after a well exec.ted manoeuvre spur you to greater efforts.   1 2 3 4 5 6

147. The threat of being suspended from training motivates you to greater efforts.   1 2 3 4 5 6

148. QFIs ignore mistakes by students, hoping the mistake will not be made again.   1 2 3 4 5 6

149. Students are punished for their mistakes.   1 2 3 4 5 6

150. The criticism given by QFIs is most often constructive.   1 2 3 4 5 6

151. The primary cause of poor performance by students is a lack of preparation by the student.   1 2 3 4 5 6

152. A good flight motivates you to greater effort.   1 2 3 4 5 6

153. It is important for QFIs to set a proper example when in the air.   1 2 3 4 5 6

154. It is important for the QFIs to set a proper example when on the ground.   1 2 3 4 5 6

Draft Outline of New Survey

Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6

Please use the rating scale at the top of this page to indicate **YOUR AGREEMENT OR OTHERWISE** with the following statements:

155. Students are properly instructed in how
    to study effectively.   1 2 3 4 5 6

156. Students are properly instructed in how
    to learn material.   1 2 3 4 5 6

157. Students are fully briefed on the
    training objectives of the pilots course.   1 2 3 4 5 6

158. Students are fully briefed on the purpose
    behind flying tests.   1 2 3 4 5 6

159. Students plan ahead and prepare for the
    next GF, IF and Navigation sortie to cope
    with program changes.   1 2 3 4 5 6

160. Students prepare maps and flight plans
    well in advance of the next Navigation
    flight.   1 2 3 4 5 6

161. Students use the weekends to catch up in
    areas where they have fallen behind.   1 2 3 4 5 6

162. QFIs maintain a high standard of
    instruction in the air.   1 2 3 4 5 6

163. QFIs maintain a high standard of
    instruction during mass briefings and
    tutorials.   1 2 3 4 5 6

164. Ground school instructors maintain a high
    standard of instruction during ground
    school subjects.   1 2 3 4 5 6

Draft Outline of New Survey

Demographic Data

165. What was your age when you first applied
     for pilot training with the RAAF?

     a.   17 - 19
     b.   20 - 22
     c.   23 - 25
     d.   26 - 27   a b c d

166. What was your age when you commenced pilot
     training with the RAAF?

     a.   17 - 19
     b.   20 - 22
     c.   23 - 25
     d.   26 - 27   a b c d

167. What was your occupation just prior to
     commencing the pilot training course?

     a.   High school student.
     b.   In civilian employment.
     c.   Tertiary student.
     d.   Officer cadet.
     e.   RAAF airman.
     f.   RAAF navigator.
     g.   Other RAAF officer.   a b c d e f g

168. What is your marital status?

     a.   Married.
     b.   Single.
     c.   Other.   a b c

169. What is the highest Phase of the pilots course
     that have you completed?

     a.   Phase 1.
     b.   Phase 2.
     c.   Phase 3.
     d.   Phase 4.
     e.   Phase 5.   a b c d e

170. How many gliding hours did you have prior
     to arriving at 1FTS?   _____

171. How many powered flying hours did you have
     prior to arriving at 1FTS?   _____

THE UNIVERSITY OF NEWCASTLE
NEW SOUTH WALES, 2308

DEPARTMENT OF EDUCATION

TELEPHONE 68 0401

532
EXT.

24th March, 1987

Squadron Leader Graham Rowe,
2781 Woodmont Drive,
Beaver Creek, Ohio 45385
U S A

Dear Graham,

Good to hear from the Aussie in Beaver Creek. I've enclosed what I could locate easily: let me know if there are others you seek.

ACER is the Australian Council for Educational Research: Hawthorne, Victoria. They certainly have the two kits, recently advertised.

By all means use what you want from the book (to be published in revised form by Iowa State University Press later this year).

I look forward to reading your thesis: please keep me up to date.

All the best,

Associate Professor Ross Telfer,
Head of Department

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Mr Graham S. Rowe
2781 Woodmont Drive
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VITA

Wing Commander Graham Rowe was born on 8 January 1950 in Dubbo, New South Wales. He completed his secondary education at Balgowlah, Sydney in December 1967 and joined the Royal Australian Air Force Academy in January 1968. Upon graduation in December 1971, he commenced pilot training and received his wings in March 1973. He has served as a transport pilot and a Qualified Flying Instructor in a number of flying squadrons and has served on the military staff at both the Royal Australian Air Force Academy and the new Australian Defence Force Academy. He entered the School of Systems and Logistics, AFIT, in June 1986.

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BLOCK 19.. ABSTRACT

The initial purpose of this study was to analyze an already administered survey. The given survey had been administered to student pilots in the Royal Australian Air Force in an attempt to identify possible problem areas in the RAAF pilots course. Identified problem areas were to be reviewed in order to reduce the failure rate of student pilots in the RAAF. The study had five basic objectives: (1) Identify those factors in a pilot training course that could significantly influence the performance and progress of a student pilot. (2) Establish the criteria for a valid survey instrument that would identify those factors causing poor student performance. (3) Determine if the existing survey was effective in identifying those factors causing poor student performance. (4) Analyze the existing survey and assess the value of the data. (5) If necessary, construct an improved survey instrument.

It was found taht the broad aspects of training which affect a student's performance are learning, motivation and evaluation. These broad aspects were further defined and expanded to suit a pilot training course. The existing survey contained a great deal of information but not in the form that allowed statistical testing of any power. The information contained in the existing survey was used to construct an improved survey instrument to investigate if problem areas exist in the current RAAF pilots course. It is recommended that this new survey instrument be used to continue research into possible areas in the RAAF pilots course.

END
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